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Contents

Increasing Track Capacity

IN a paper presented before the convention of the Signal section, A. R. A., at the Drake Hotel yesterday, T. W. Cheatham, division superintendent of the Missouri Pacific at Osawatomie, Kan., explained how the average speed of freight trains had been increased 22 per cent and the ton-miles per train hour increased 20 per cent on a 56-mile single track subdivision between Kansas City, Mo., and Osawatomie, Kan. The locomotive coal consumption was 174 lb. per 1,000 gross ton-miles in October, 1925, as compared with 197 lb. per 1,000 gross ton-miles in October, 1924. These savings in increased ton-miles per train hour have been accomplished within the last 18 months by relocating passing tracks and adding lap sidings at other points in addition to the installation of a unique system of controlled-manual block signals by which train movements are now directed by signal indication without written train orders. The passing track switches at the laps are included in the interlocking plants, and the outer switches and also the switches at intermediate blind sidings are operated by remote control machines. This type of construction represents an efficient solution of the problems of securing added track capacity without the expense of a complete second track program. The new sidings, together with the signaling, form a combination that might be applied satisfactorily on numerous busy single track divisions now operating near capacity in normal traffic and congested in rush seasons.

Conserving Convention Time

WITH the opening of the convention this morning the American Railway Engineering Association is confronted once more with a congested program. With reports to be heard from 22 regular and several special committees in the course of the six sessions it becomes a matter of conserving every available minute. But in spite of a maximum of efficiency in parliamentary procedure, the volume of matter submitted by the committees is so great that portions of their reports will necessarily be passed over with little or no discussion.

The need for some modification of the present plan of conducting the convention or the work of the committees has been discussed frequently, but thus far the board of direction has not seen fit to make any change—no doubt because no improvement over the present arrangement has presented itself. The association is therefore compelled to make the best of it under the plan now in vogue and this means utmost economy in the use of time.

The object of the convention is to secure the fullest possible discussion of the reports, which should imply comments or criticisms by persons not members of the reporting committee—except as they are compelled to explain or defend the report or answer questions asked from the floor. As the reports have been distributed well in advance of the meeting, it should be assumed that each report has been studied by engineers particularly interested or concerned with the particular subject. In view of this there should be no occasion for committee or sub-committee chairmen to consume valuable time in a detailed outline of the contents of their reports or in other extended introductory remarks.

Common Sense Interlocking Contracts

AS a result of the valuation of the railroads, there has arisen among signal officers a greater appreciation of the desirable features of a simple and just basis of distributing the ownership, operating and maintenance charges of joint interlocking facilities between the interested parties. When interlockers were first installed little attention was given to this question, probably because of the simplicity of some of the earlier installations and the lack of any need for provisions for future changes in the plants. Most of the older contracts covering these installations were, therefore, worked out on a rather arbitrary basis,

usually on the number of working levers assigned to each road. This led to complications later, when changes in traffic made it advisable to extend or alter the existing plant, frequently causing an unjust division of expense. On the basis of the number of levers required by each road there is a great temptation to overload certain levers in order to shift as much of the expense burden as possible to the other road. The line with the heavier traffic may desire certain improvements, such as electric locking to facilitate operation, which on the original contract basis will involve difficulties in the distribution of the charges. A more logical basis for contracts of this nature, and one which is flexible enough to take care of all additions and retirements to the plants, without introducing troublesome difficulties, is that of allocating the various operated functions in the interlocking to each owning road on a unit basis, mutually agreeable. The advantages of this plan are illustrated clearly in the report of the Committee on Contracts and Valuation of the Signal section. Time spent in studying the examples there given will be well spent because their application will reduce misunderstandings and simplify the task of drawing up new or revising old contracts.

The Signal Section and Engineering Week

THE Signal section of the A. R. A., having an established practice of holding its annual convention in Chicago during the exhibition of the National Railway Appliance Association and during the same week as the convention of the American Railway Engineering Association, holds a decidedly close relationship to both of these bodies. The displays of train control equipment, signal and interlocking apparatus and associated accessories form a considerable proportion of the exhibits at the Coliseum, and the representatives of the manufacturers take an active part in the affairs of the National Railway Appliances Association, both the president and vice-president for the current year being representatives of manufacturers in the signaling field.

The Signal section, A. R. A., started its two-day annual convention yesterday morning with its program so arranged that engineering officers who are members of the A. R. E. A. might have the opportunity of hearing the reports relative to the economic questions of signaling, factors of special interest to engineering officers. Likewise, on Wednesday, after the close of the Signal convention, the Signal and Interlocking Committee of the A. R. E. A., composed of signal engineers, will present its annual report to that body, explaining developments in train control, the progress being made on installations in service and under way, and a discussion of the orders of the Interstate Commerce Commission with respect to train control.

The design, construction, maintenance and operation of signal, interlocking and train control equipment is an increasingly important phase of engineering, while on the other hand the proper adaptation of this equipment to increase ton-miles per train hour is just as much an operating problem as grade reduction or second tracking. It may be seen, therefore, that these two bodies, the Signal section, A. R. A., and the American Railway Engineering Association, have much in common, and it is to be hoped that arrangements can be made next year for at least a half day's joint session to discuss problems of interest to members of both associations.

Rights of Associate Members Disregarded

MUCH feeling and discussion have been caused by the way in which the entertainment committee has this year handled the issuance of tickets for the annual banquet of the A. R. E. A. which will be held Wednesday night. The matter may seem to some of not much importance, but it really is of such importance that the attention or lack of attention given to it by the board of direction will largely influence the attendance at and success of future banquets.

The constitution of the association, section 5, article 2, paragraph C, provides that "An associate member shall have all the rights of members except those of voting and holding office". The entertainment committee on January 30, over the signature of its chairman, sent to all regular and associate members a letter implying that seats at the dinner would be assigned in the order of the receipt of applications, "first come, first served". Owing to the success of and large attendance at the dinners within recent years the reservations made were large. In the allotment of seats the applications of the associate members were set aside until the applications of the regular members were taken care of. In consequence the seats assigned to associate members are the poorer ones in the dining room.

It may be said the regular members were entitled to prior consideration. Three answers can be made to this. First, it is well known that numerous regular members attend the dinners as guests of associate members, and the result will be that these regular members will have relatively undesirable seats. Secondly, the letter of invitation sent out by the entertainment committee indicated that seats would be assigned in the order in which applications were received, and good faith required the implied promise to be kept. Third, the method of making assignments adopted disregarded the constitutional provision that an associate member shall have all the rights of members except those of voting and holding office.

Regardless of these considerations, the question may be pertinently asked why in a matter of this kind there should be any discrimination against associate members. They do not pay any less dues than the regular members and they do valuable work in the association. Witness the technical information placed at the service of the Track committee by associate members in the employ of the frog and switch manufacturers, not to mention the thousands of dollars they have expended in the preparation of designs for standard track work for the Track committee at its direction. Similar help has been rendered the Rail committee and numerous other committees, not excepting the entertainment committee itself, by associate members. The banquet is the chief and, in fact, the only, entertainment feature of the convention. It is desirable that it should be largely attended because the dinners cannot be a real success unless they are largely attended.

The policy adopted by the entertainment committee this year with reference to seating has caused much dissatisfaction and will tend to reduce the attendance at future dinners unless the board of direction makes it known that a different policy will be followed in the future. The treatment given associate members in this instance is not in accordance with the traditions and recognized high standards of the A. R. E. A.

An Early Start

The attention of the members of the American Railway Engineering Association is called to the fact that the convention will be called to order promptly at nine o'clock this morning. In view of the heavy program which is to be presented, it is to be hoped that the members will make a special effort to be prompt.

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One of the interesting newcomers among the exhibitors at the Coliseum this year is Sears, Roebuck & Co., the national mail order house. This firm has recently organized a railroad department and this department is presenting an exhibit at the Coliseum.

* * *

The Committee on Co-operative Relations with Universities will meet at the University Club for dinner at 6 o'clock this evening to consider the report which it will present at the convention tomorrow and to prepare plans for the work of the ensuing year. Chairman R. H. Ford desires that every member be present.

* * *

The New York Central lines has arranged for one of their Pacific type locomotives, No. 4882, equipped with Miller intermittent, induction train control apparatus to be on exhibit at the La Salle street station today and tomorrow, affording anyone interested an opportunity to examine in detail this equipment, which is now being installed on the New York Central lines between Toledo, Ohio, and Detroit, Mich.

* * *

The members of the Executive Committee of the Roadmasters' Association will meet at the Auditorium hotel at 9 o'clock on Wednesday morning, March 10, to review the work done by the various committees of that association to date and to consider other matters of importance to the association. The meeting will adjourn at 1 o'clock to enable the members to visit the exhibit of the National Railway Appliances Association in the afternoon.

* * *

The members of the board of direction of the American Railway Engineering Association met in room 1502 yesterday morning to complete the business of the association for the year. The directors present included H. R. Safford (past president), F. J. Stimson, C. E. Johnston, W. H. Kirkbride, J. L. Campbell (past president), D. J. Brumley, vice-president; C. F. W. Felt, vice-president; J. M. R. Fairbairn, president; E. H. Fritch, secretary; A. F. Blaess, J. R. W. Ambrose, G. D. Brooke, G. H. Bremner, treasurer, and A. O. Ridgway.

Purdue Luncheon Today at Field's

A special luncheon of Purdue University alumni will be held in the Walnut room on the seventh floor of Marshall Field & Company's retail store at 12:30 p. m. today. Among the guests will be President Edward C. Elliott and Dean Stanley Coulter. In view of the early retirement of Dean Coulter and the service that he has rendered the university, Purdue alumni are endeavoring to make this affair one of unusual interest.

The Signal Section Program

The program for the Signal section at the Drake hotel today is as follows:

Committee V—Instructions.

Committee III—Power Interlocking.

Committee VIII—Alternating Current Automatic Block Signaling. Paper on "Lightning Protection for Low-Voltage Circuits," by E. Beck, Westinghouse Electric & Manufacturing Co.

Committee IV—Direct Current Automatic Block Signaling.

Committee IV—Direct Current Automatic Block Signaling and Committee VIII—Alternating Current Autmatic Block Signaling.

Committee VI—Designs.

Committee XI—Chemicals.

The A. R. E. A. Program

Morning sessions, 9:00 a. m. to 12:30 p. m. and afternoon sessions, 3:00 p. m. to 5:00 p. m.

Today

President's Address.
Reports of Secretary and Treasurer.
Reports of Standing and Special Committees:

Rules and Organization	Bulletin 280
Ballast	Bulletin 280
Iron and Steel Structures	Bulletins 280, 285
Electricity	Bulletin 280
Economics of Railway Location	Bulletin 280
Water Service	Bulletin 281
Records and Accounts	Bulletin 281
Shops and Locomotive Terminals	Bulletin 281

Wednesday

Signals and Interlocking	Bulletin 281
Signs, Fences and Crossings	Bulletin 282
Yards and Terminals	Bulletin 282
Uniform General Contract Forms	Bulletin 282
Masonry	Bulletin 282
Stresses in Railroad Track	Bulletin 282
Rail	Bulletin 283
Track	Bulletin 283
Co-operative Relations with Universities	Bulletin 285

ANNUAL DINNER 6:30 P. M.

Thursday

Ties	Bulletin 283
Economics of Railway Operation	Bulletin 284
Roadway	Bulletin 284
Wooden Bridges and Trestles	Bulletin 284
Wood Preservation	Bulletin 284
Clearances—Progress Report	Bulletin 284
Economics of Railway Labor	Bulletin 285
Buildings	Bulletin 285

New Business.
Election and Installation of Officers.
Adjournment.

The Signal Section in Session at the Drake Yesterday

Signal Section Meets at the Drake

Several Interesting Papers and Reports Presented at Thirty-first Annual Convention

THE first day's session of the Signal Section, A. R. A., annual meeting was opened at the Drake hotel at 10 o'clock yesterday morning. This was the fourth annual meeting to be held in March, under the program initiated three years ago of holding two meetings each year instead of three, and the 31st annual convention of signal officers. W. M. Post, assistant chief signal engineer, of the Pennsylvania Railroad, presided. An unusually large attendance was present. Two papers, somewhat broad in their scope, but on a subject in which signal officers are interested, training of employees, were features of yesterday's session. A paper on "Electro-Mechanical Interlocking" was presented by P. A. Rainey, electrical engineer, telegraph and signal department, Pennsylvania, at the morning session. During the afternoon session papers were presented on the "Economics of Railway Signaling," by B. J. Schwendt, assistant signal engineer, New York Central; "Train Operation by Signal Indication" by T. W. Cheatham, superintendent, Missouri Pacific; "Some Problems in Employee Training" by L. L. Park, educational director, American Locomotive Company, and "The Aim of Technical Education" by E. H. Freeman, professor of electrical engineering, Armour Institute of Technology. Mr. Cheatham's paper was well illustrated with lantern slides. His presentation was followed by an open discussion. The meeting opened with the annual address of the chairman, W. M. Post, an abstract of which follows:

Chairman Post's Address

During the 31 years since the inception of the Railway Signaling Club, the problems met and solved by the signal engineers have been many and varied, but none of them exceeds in importance those presented at this time. In its broadest aspect the most important task that lies before the railways today is that of earning a fair return on the property investment devoted to the service of transportation. In spite of the heavy traffic of 1925, the carriers of this country earned in that year a return of but 4.83 per cent on the property devoted to transportation service of approximately $23,500,000,000. It is true that this was the highest percentage of return earned in any year since 1917 but, it is also true that it fell short of the 5¾ per cent that the Interstate Commerce Commission has determined to be the reasonable rate of return.

No signal engineer can fail to know that there has been, in the past three years, a phenomenal increase in the efficiency of railway operations.

The railway traffic of 1925, measured in revenue freight car loadings, was the largest in the country's history, and it was about five per cent larger than in 1924.

The expenses of the Signal section are about $28,000 a year. Approximately $6,000 is realized from dues and the sale of literature. The remainder, $22,000, is appropriated by the American Railway Association. It is more important, however, that the results of our work justify the cost, and we believe they have many times over. The economies that have been effected on railroads through the combining of two or more interlockings, so as to operate from one interlocking station, and the use of automatic signals and remotely operated switches to facilitate traffic, have, in many cases, been brought about through the influence of the Signal section.

The work of the Signal section is entrusted to 13 standing committees and a special committee on highway crossing protection. During the calendar year 1925, 66 committee meetings and 32 sub-committee meetings were held, which is an indication of the healthy and active condition of the section.

One of the assignments for each committee this year has been the revision of the manual, and this assignment will be continued for another year. The Committee of Direction has definitely assigned each specification and drawing in the Manual to some comittee.

The Manual contains the results of study and research

of our committees covering many years. In order to keep it worthy of the pride we have in it and of the continued confidence of those who use it, it should be thoroughly analyzed and brought up to date. Signaling practices change rapidly and vigorous action is necessary in order to prevent much in the Manual from becoming so out of date as to be useless. The reports of the standing and special committees have received much favorable commendation and the thoroughness of their work is indicated by the limited criticism of their reports on the floor at our meetings. Committees have prepared and will present at this meeting, 6 specifications and 36 drawings. The amount of work accomplished by Committee V—Instructions, is worthy of special mention. It has undertaken, with the assistance of other committees, the preparation of hand books on signaling, which will be presented as each chapter is completed. These hand books should prove a valuable aid in training men entering the signal field and because of the comparative dearth of books on signaling subjects, should fill a long felt want.

The Requisites for Highway Crossing Protection have been unanimously adopted by letter ballot; approved by Division IV—Engineering, and by the Board of Directors of the American Railway Association. They are now the recommended practice of that Association. These requisites are one of the outstanding accomplishments of the Signal section.

The Train Control Problem

Committee X—Signaling Practice, has continued the report on train control at the 1924 stated meeting and brought the information up to date. The chief complication in train control results, of course, from the difficulty with any method of control of assuring proper braking of heavy freight trains. The question is, can automatic devices ever be so perfected as to serve as an adequate substitute for the skill that the trained engineman uses in operating his air brakes. There are many who believe that out of the many experiments, the cab signal has been the outstanding development and that by its use the causes of train collisions can be eliminated without at the same time bringing in complications difficult to overcome. A cab signal on both the engineman's and the fire man's side of the locomotive cab, with a whistle to sound on each change to a less favorable signal indication and to continue to sound until acknowledged by the engineman, has been suggested as a means to bring the signal indication unmistakably to the engineman, to keep him alert, and to call the fireman's attention to every change to a more restrictive indication. Those believing in the value of this form of signal believe that most, if not all, collisions are caused by the engineman's missing or misreading signals, not being alert, or being disabled, and they believe that the engineman can be depended upon to handle his train properly if the signal indications have been received and understood by him. In the system described, if the engineman is disabled the whistle will continue to sound and will attract the fireman's attention in time to take action.

Some are of the opinion that it is sufficient to stop a train automatically unless the engineman forestalls application of the air brakes when receiving a more restrictive signal indication, and that the cab signal is unnecessary. On the other hand, others think that if anything is required it is desirable to provide wayside signals, cab signals, and speed control, in order to obtain full benefit for the money expended, while still others believe that wayside signals are not necessary if cab signals are used.

Other variations are two-speed versus three-speed control and two indication as against three indication cab signals. There are the further complications of continuous induction with 60, 100 and 140 cycles, ramps, and intermittent induction, with the resultant difficulties of clearances, used to transmit the control onto the locomotive.

It is hoped that the railroad managements, co-operating with the Interstate Commerce Commission, can find some common ground which will avoid the economic waste which must follow from lack of interchangeability of power between roads or the equipping of engines using joint track facilities with two or more train control systems, if all these varying systems, and possibly others, are generally adopted.

Operating and Economic Problems

The American Association of Railroad Superintendents, at its last annual convention, passed a resolution:

> Believing that the practice of directing train movements by signal indication in lieu of train orders is to become, in the near future, the popular method on heavy single as well as double track lines, it is the recommendation of this committee that this convention pass a resolution tendering the services of this committee to work and co-operate with the Signal Economics Committee of the Signal section of the American Railway Association.

Your committee of Direction instructed the chairman of Committee I of the Signal section to invite the members of the Superintendents' Train Rules Committee to attend the Economics Committee's meetings and take part in the work of the committee. Concurrence in the views of this section, that signals measurably assist in freight train operation, is evidenced in conclusions reached in a study made by the American Railway Engineering Association Committee on the Economics of Railway Operation. The report will be presented this week at the annual meeting of that association.

At our last annual meeting attention was called to that part of President Ray's address before the American Railway Engineering Association, suggesting closer co-operation between the Signal section and that association. As a result, Signal section members were added to A. R. E. A. committees and A. R. E. A. members were added to our Committee I. The question of joint meetings while certain committee reports are being presented, has been discussed by the officers of the A. R. E. A. and Signal section, but so far it has not seemed practicable to do this.

Signal officers in other countries are thinking along much the same lines that we are. Thus, the president of the Institution of Railway Signal Engineers of England, A. F. Bound, in an interesting address at their last annual meeting called attention to the necessity of signal engineers doing their part in the campaign for economy of operation. Several members of the Signal section are members of the Institution of Railway Signal Engineers. I would suggest that consideration be given to the establishment of some reciprocal relations between their institute and our section, with a view of including in our literature whatever would be of value to our members and letting them have whatever may be helpful to them from our literature.

The work of Committee I will be seen to have given us considerable opportunity for co-operation with other important associations. While on this point, it might be well to refer to the several installations of Car Retarders that have been made during the year. This is a new field for the signal engineer and brings him closer to the problem of yard operation than heretofore. The chances for substantial economics offered by this development no signal engineer can afford to neglect.

The widening scope of our activities is indicated by the co-operative work with other organizations. Thus,

we have Conferees on 17 Committees of the American Engineering Standards Committee. We are co-operating with the American Association of Railroad Superintendents, American Railway Engineering Association, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Society for Testing Materials, American Wood Preservers Association, American Committee on Inductive Coordination, Bureau of Mines, and the Telegraph and Telephone section of the American Railway Association.

The application of signals and interlockings so as to effect economies in railroad operation offers unlimited opportunities for study and development. All possible encouragement and help should be given Committee I in its endeavor along this line. The education of signal employes through the use of the hand books being prepared by Committee V is sure to be an important development of our activities. The appalling loss of life at highway grade crossings calls for continuation of our best thought to help reduce the number of such accidents. The solution of the train control problem is a challenge to this section. The development of car retarders and their application as both an economic and safety measure is a problem for this section. I do not believe there has ever been a time when the responsibilities of the Signal section or the opportunities for the signal engineer were any greater than they are today.

Report of the Committee of Direction

THIS committee called attention to certain matters upon which it had acted during the period from March 13, 1925, to March 7, 1926:

A total of 173 new memberships were approved.

Rule 13, as printed in the March, 1925-1926 Hand Book, and which read, "Committees shall not exceed 20 members" was eliminated from the Rules for Commitee's Committee.

The subject-matter approved for letter ballot action at the 1925 annual meeting was ordered submitted to the board of directors of the American Railway Association for official approval. This action was taken and official approval received July 21, 1925.

The 1926 Additions and Revisions to the Signed Section Manual, complete to December 31, 1925, containing subject-matter officially approved by the board of directors of the American Railway Association were ready for distribution to Manual holders on January 2, 1926.

The appointment of A. B. Hines (B. & O.) as Signal section representative and F. A. Beck as alternate on the Committee on Standards for Storage Batteries of the American Institute of Electrical Engineers, was approved.

The work done by B. T. Anderson (C. & O.) in connection with the revision of *Railway Engineering and Maintenance Cyclopedia* was approved.

The outline of work of Committee XIII—Editing was enlarged to include co-operation with the *Railway Age* in future editions of *Railway Engineering and Maintenance Cyclopedia.*

The sub-committee composed of C. A. Christofferson, F. B. Wiegand and F. W. Pfleging, appointed to review the Manual, was abolished. The work of this sub-committee is to be continued by Committee XIII—Editing.

Committee I—Economics of Railway Signaling was instructed to notify the American Association of Railroad Superintendents of all its meetings and invite the members of its Train Rules Committee to attend. The chairman of the Signal section also extended a cordial invitation to that association inviting its members to attend all Signal section meetings.

H. J. Forster of the American Railway Association was advised that where specifications are prepared jointly by two or more sections of the American Railway Association, each specification should receive the approval of the sections or divisions preparing the specification and after official approval of the same by the board of directors of the American Railway Association each section should identify the specification according to the section's method, and use an asterisk following the identification to call attention to a footnote in which proper reference should be made to sections participating.

In the matter of information to be secured as to the capacity of freight cars, their weight and nominal braking power, as suggested at the 1925 annual meeting, the following resolution of Committee X was approved.

"Committee X is of the opinion that the information regarding capacity of freight cars, their weight and nominal braking power is not of value commensurate with the efforts required to secure it. It will require something more than the regular force to tabulate all the figures that may come in in answer to a questionnaire as is proposed.

"G. E. Ellis, secretary of the Committee on Automatic Train Control of the A. R. A., also a member of the committee, has talked to various operating officials of different railroads on this matter and none of them seem to think the results would justify the efforts.

"If data such as above is to be collected, the Automatic Train Control Committee of the A. R. A. should handle the matter. The chairman of that committee has advised against procuring such information. Committee X recommends against procuring such inforation."

Report of the Secretary

THERE was a net increase in membership during the year of 47, according to the annual report of H. S. Balliet, secretary. A total of 250 new members was added and 203 members were dropped from the rolls. Of the latter, 147 were removed on account of their failure to pay their 1925 dues.

Membership as of March 13, 1925			2004
Additions during the year		250	
Losses by death during the year	13		
Resignations	14		
Dropped from rolls	176	203	
Net gain in membership		47	47
Total membership			2051

There were 108 committee meetings held during the year, 44 of which were in New York; 36 in Chicago; 12 in West Baden, Ind.; 3 in Washington, D. C.; 2 in Pittsburgh, Pa.; 2 in Buffalo, N. Y.; 2 in Cleveland, Ohio; 2 in St. Louis, Mo., and the balance of 5 in the following cities: Atlantic City, N. J.; Kansas City, Mo.; Macomb, Ill.; Schenectady, N. Y., and Youngstown, Ohio. The total attendance at all committee meetings was 669.

There were issued to members 1163 copies of minutes of committee meetings.

During the period covered by this report, there were 8 publications issued, containing a total of 2,580 actual pages of printed matter; the total number of copies printed was 15,910 and the total number of sheets (standard size 6 in. by 9 in.), 3,929,540. The number of letters and telegrams written in the secretary's office in correspondence (not including form letters) was 3,830 and the number of circulars, 8.

Tribute Paid to George M. Basford

In a resolution on the death of George Marshall Basford, an affiliated member and organizer and first secrtary of the Railway Signal Club, who died on October 26, 1925, W. H. Elliott (N. Y. C.), on behalf

of the Signal section paid to following tribute to his memory:

"WHEREAS, Almighty God, in the exercise of His Divine will, has taken from us our honored founder and esteemed fellow member, George M. Basford, and,

"Whereas, we desire to express our recognition and sincere appreciation of the work done on behalf of this body by Mr. Basford,

"Therefore, we, as members of the Signal section of the American Railway Association, now pause and pay our last sad tribute to the honored memory of our sincere friend, to express our appreciation of his work in our behalf and our sincere sorrow that death has deprived this section of its founder and valued member.

"Therefore, be it resolved that in the death of George M. Basford this section laments the loss of our esteemed founder and fellow member, our friend and business associate, our respected and honored friend of the railroads, and a worker whose interest in and efforts on behalf of the young railroad apprentice has endeared him to all; and that the heartfelt sympathy of the members of this section be extended to his sorrowing family in their affliction; and that these resolutions be spread upon the records of the section and that an engrossed copy be sent to Mr. Basford's family."

W. J. Gillingham, the other surviving member of this original group and the first president of the Railway Signaling Club, reviewed the gradual evolution of the club over a period of 31 years. A. H. Rudd (Penna.) closed the tribute to Mr. Basford by citing some intimately personal reminiscences from his own experience.

Report of Committee VII—Contracts and Valuation

Contractual relationships arising from joint ownership, maintenance and operation of interlocking facilities are involved wherever one railroad crosses another under some form of signal protection. Many of the older contracts of this type have been worked up along a more or less arbitrary basis, such as the number of levers in the machine, without any consideration to the other interlocking apparatus inside and outside of the tower. Whenever changes in joint facilities require corresponding changes in the contract, certain disputed points frequently entail considerable correspondence. The report of this committee presents a unit basis for distributing costs of construction, maintenance and operation. ***G. E. Beck, signal valuation engineer, New York Central, is chairman.***

G. E. Beck
Chairman

THE committee submitted an example and explanation of the use of the unit value basis for the construction, operation and maintenance of jointly owned interlockings. The committee recommended that the example be accepted for submission to letter ballot.

Example of Use of Unit Value Basis

Exhibits A, B and C cover a mechanical interlocking plant which was constructed, operated and maintained 50 per cent by each of the original users. During 1918, another carrier is admitted into the interlocking and pays 100 per cent of the cost of 24 units added for its benefit. The carrier entering the plant will be billed for its proportion of original tower and out-buildings and if this carrier does not provide lever extension to the machine, it is billed for its proportion of the original machine in proportion to number of levers used.

EXHIBIT "A"

At the time this change is made the two parties in the original plant decide to make some changes, consisting of 16 units for the benefit of one of them, and 32 units which they agree are joint on the original basis 50-50. At this time there is also a retirement of two units, on account of change from two-position signals to three-position signals. As the original two-position signals were on a 50-50 basis, the unit retirement is made from joint units total, and the two original roads share in credit for salvage.

The entire plant as now rebuilt is apportioned on a unit basis and summary shows that the proportions of each company are as follows for year 1918:

A. B. R. R.	47.60%
C. D. R. R.	37.95%
E. F. G. R. R.	14.45%
	100.00%

EXHIBIT "B"

During 1919, certain additions are made to the plant and each carrier participates in the cost of construction, in the proportion that the number of units installed for its benefit, bears to the total number of units installed.

This proportion is determined as follows:

A. B. R. R.	12 units	60%
C. D. R. R.	4 units	20%
E. F. G. R. R.	4 units	20%
	20 units	100%

We now have a plant in which the unit proportion of the whole has changed and have determined that each carrier is now responsible for the proportion which for the year 1919 summarizes as follows:

A. B. R. R.	48.93%
C. D. R. R.	36.02%
E. F. G. R. R.	15.05%
	100.00%

EXHIBIT "C"

In 1920, to care for heavy rail, it is decided to remove bars and use electrical route locking protection.

The cost of making this change is apportioned to each carrier in proportion to the units installed for its benefit; this proportion is as follows:

A. B. R. R.	12 units	20.69%
C. D. R. R.	24 units	41.38%
E. F. G. R. R.	22 units	37.93%
	58 units	100.00%

The 28 units for bars retired are retired from the 186 joint units and each carrier participates in credit for salvage to the extent of its proportion in 186 units, which would be as follows:

A. B. R. R.	48.93%
C. D. R. R.	36.02%
E. F. G. R. R.	15.05%
	100.00%

The plant now having been increased to 244 units, less 28 units retired, leaves 216 units in service and the responsibility of each carrier's proportion of the whole has for 1920 now changed to the following:

A. B. R. R.	41.34%
C. D. R. R.	37.46%
E. F. G. R. R.	21.20%
	100.00%

It is recognized that where the old agreements do not provide for unit proportions, the division being made on a flat lever or arbitrary basis, the unit value basis cannot be used unless the interested carriers agree to such unit value use, but all new agreements should recognize the unit value basis when they are drawn up.

A study of 12 mechanical and power plants representing 739.75 units assigned on the lever and arbitrary basis and 3,004 units on the A.R.A. basis shows that the difference was 1.02 per cent on the average for the 12 plants.

Construction and Ownership

The unit value basis readily lends itself to a division of ownership of a plant on the construction investment basis, which in turn can be said to represent a carrier's proportion of responsibility in the plant and therefore should determine its proportion of construction charges and ownership.

Operation and Maintenance

As the interlocking plant is composed of various units for which each road is responsible for its part, the unit value basis will set up percentage of responsibility to each party which should cover both operation and maintenance, unless exceptional operating conditions are present at some individual plant.

To ascertain what proportion of joint interlocking plants use the same proportion for operation and maintenance, 120 mechanical and power plants were studied, in which plants 47 different carriers were interested. It was found that 83 plants or 69 per cent of the total number used the same proportion for both operation and maintenance. The 37 plants, or 31

Exhibit "A"

Additions are made to original plant and a new road is taken in.

Two signals are retired.

UNITS	Unit Values	Original Plant Joint A.B.R.R. 50% C.D. R.R. 50%	Additions 1918 A.B.R.R. 100%	Additions 1918 Joint A.B.R.R. 50% C.D.R.R. 50%	Additions 1918 E.F.C.R.R. 100%	Totals
10 derails	4 each	32			8	40
10 signals, 2-position	4 each	32			8	40
10 F.P. locks	2 each	16			4	20
550′ detector bar	2-55′ or fraction	16			4	20
2 signals, 3-position	6 each		12			12
2 track circuits	2 each		4			4
4 switches	4 each			16		16
4 F. P. locks	2 each			8		8
220′ detector bar	2-55′ or fraction			8		8
		96	16	32	24	168
Less 2 sigls. retired	1 each	2				2
Totals		94	16	32	24	166
Per cent		56.62	9.66	19.27	14.45	100

Summary 1918

A. B. R. R. proportion
50% of 56.62% + 100% of 9.66% + 50% of 19.27% = 47.60%
C. D. R. R. proportion
50% of 56.62% + 50% of 19.27% = 37.95%
E. F. G. R. R. proportion
100% of 14.45% = 14.45%
100.00%

Exhibit "B"

Twenty units are added to plant

UNITS	Unit Values	Plant as of 1918 Joint A.B.R.R. 47.60% C.D.R.R. 37.95% E.F.G.R.R. 14.45%	20 unit addition 1919 A.B.R.R.	C.D.R.R.	E.F.G.R.R.	Totals
		166				166
3 switches	2		4	2		6
3 F. P. locks	2		4	2		6
2 2-position signals	4		4		4	8
Totals		166	12	4	4	186
Per cent		89.25	6.45	2.15	2.15	100

Added 1919
Cost apportioned

A. B. R. R.	12 units	60%
C. D. R. R.	4 units	20%
E. F. G. R. R.	4 units	20%
	20 units	100%

Summary 1919

A. B. R. R. proportion 47.60% of 89.25% + 100% of 6.45% = 48.93%
C. D. R. R. proportion 37.95% of 89.25% + 100% of 2.15% = 36.02%
E. F. G. R. R. proportion 14.45% of 89.25% + 100% of 2.15% = 15.50%
100.00%

Exhibit "C"

Fifty-eight units are added to plant and all bars retired.

UNITS	Unit Values	Plant as of 1919 Joint A.B.R.R. 48.93% C.D.R.R. 36.02% E.F.G.R.R. 15.05%	58 unit addition 1920 A.B.R.R.	C.D.R.R.	E.F.G.R.R.	Totals
		186				186
6 track circuits	2 each		4	4	4	12
4 signals, 3-position	6 each			12	12	24
10 electric locks	1 each		4	4	2	10
6 annunciators	1 each		2	2	2	6
6 indicators	1 each		2	2	2	6
Totals		186	12	24	22	244
Less 770′ detector bar retired	2-55′ or fraction	28				28
Totals		158	12	24	22	216
Per cent		73.15	5.55	11.11	10.19	100

Added 1920
Cost apportioned

A. B. R. R.	12 units	20.69%
C. D. R. R.	24 units	41.38%
E. F. G. R. R.	22 units	37.93%
	58 units	100.00%

Summary 1920

A. B. R. R. proportion 48.93% of 73.15% + 100% of 5.55% = 41.34%
C. D. R. R. proportion 36.02% of 73.15% + 100% of 11.11% = 37.46%
E. F. G. R. R. proportion 15.05% of 73.15% + 100% of 10.19% = 21.20%
100.00%

per cent of the total, used an arbitrary basis as outlined in old agreements and generally applied to the older plants.

There seems to be no good reason why construction costs, ownership, operation and maintenance of a new plant should not be on a percentage basis, each carrier assuming its obligations as defined by the unit value basis and resulting percentages. By placing new work or additions to an old plant on the unit value basis, the engineer can work up his rough plans of a proposed layout, agree with interested parties on the responsibility for units involved and established percentages to be used in making up authority for expenditure (A.F.E.) without having to measure up materials or build up bill of material. There is also a decided advantage in being able to report as a whole, the new job or addition, in charging out material and labor on a unit value basis percentage.

Committee—G. E. Beck (N. Y. C.), chairman; E. T. Ambach (B. & O.), vice-chairman; R. B. Arnold (C. & N. W.), J. M. Carley (B. & A.), F. French (C. C. C. & St. L.), P. M. Gault (I. C.), C. Homewood (Penna.), W. A. Hough (Erie), G. W. Kydd (B. & O.), H. C. Lorenzen (P. M.), J. W. MacCormack (K. C. T.), W. F. Seemuth (C. M. & St. P.), A. R. Wolford (S. P.), and Leroy Wyant (C. R. I. & P.).

Discussion

G. E. Beck (N. Y. C.), Chairman: There seems to have been considerable variation in the way that the various railroads are accounting for the test installations on train control, but the committee feels that they can ignore that particular feature and confine themselves principally to the permanent installations.

The committee now asks the acceptance of this report for submission to letter ballot as revised.

Motion carried.

Report of Committee II—Mechanical Interlocking

The importance of standard specifications for electro-mechanical interlockers, in view of their increasing popularity at small and medium sized plants, is recognized by signal engineers. Standardized facilities of this type allow of future changes to these plants at a minimum cost. In many cases it is possible, when increasing the size of a plant, to add a section of electric levers to the existing mechanical machine without any change. The committee deserves credit also for presenting a new specification covering the application of electric locks and circuit controllers to mechanical machines using I. S. & F. locking. W. N. Spangler, assistant superintendent telegraph and signals, Pennsylvania Railroad, Philadelphia, Pa., became chairman of this committee in November, 1923.

W. N. Spangler
Chairman

THE committee submitted for consideration, reports on 1. Revision of Manual—(a) revision of specifications for an electro-mechanical interlocking machine, I. S. & F. miniature locking; (b) revision of specifications for an electro-mechanical interlocking machine, unit electric levers, I. S. & F. locking. 2. Joint report with Committee-III on factors which govern in determining the type of interlockings which should be installed. 3. Specifications for the application of electric locks and circuit controllers to mechanical interlocking machines, using I. S. & F. locking. The committee recommended that the specifications be accepted for letter ballot.

Application of Electric Locks and Circuit Controllers to Mechanical Interlocking Machines Using I. S. & F. Locking

1. Drawings. (a) Purchaser's drawings accompanying this specification and forming an essential part thereof, are as follows:

(b) Contractor's drawings accompanying his tender and forming an essential part thereof, are as follows:

2. Alternate Requisites. (a) alternate requisites section 13826 form a part hereof.

(b) Where blanks have not been filled, or where an option is permitted and no preference stated, the contractor's recommended practice shall be followed.

3. Material and Workmanship. (a) Material and workmanship shall be first-class in every respect.

4. Inspection. (a) Purchaser may inspect the completed product to determine that the requirements of this specification have been met.

(b) If purchaser is to make inspection at point of production, it shall be so stated.

5. Tests. (a) Tests of the completed work may be made by the purchaser to determine that the requirements of the specification have been met.

6. Location. (a) Electric locks** shall be located over the locking bed for the following levers:.....

(b) Electric locks** shall be located below the interlocking machine floor for the following levers:.....

(c) Electric locks** shall be located on the following levers:

(d) Circuit controllers shall be located over the locking bed for the following levers:.....

(e) Circuit controllers shall be located below the interlocking machine floor and connected direct to rocker links for the following levers:.....

(f) Circuit controllers shall be located below the floor and connected to tail levers for the following levers:.....

7. Mounting. (a) Electric locks** placed over the locking shall be rigidly supported on a structure securely attached to the machine frame and providing not less than 7 in. clearance above locking bracket caps; electric locks shall be connected direct to rocker links with ⅝ in adjustable straight rods.

(b) Electric locks** placed below the floor shall be supported on a structure so attached to the interlocking machine or supporting frame as to maintain a rigid and permanently fixed relation between the machine and electric locks and providing a clearance of not less than 20 in. above the electric locks; electric locks shall be connected direct to rocker links with ¾ in. adjustable straight rods.

(c) Electric locks** on levers shall be securely attached thereto and connected direct to latch rods.

(d) Circuit controllers placed over the locking shall be rigidly supported on a structure securely attached to the machine frame

**Includes combined electric locks and circuit controllers.

and providing not less than 7 in. clearance above locking; circuit controllers shall be connected direct to rocker links with ⅝ in. straight adjustable rods.

(e) Circuit controllers placed below the floor and connected to rocker links shall be supported on a structure so attached to the interlocking machine or supporting frame as to maintain a rigid and permanently fixed relation between machine and circuit controllers and providing not less than 20 in. clearance above circuit controllers; a ¾ in. straight adjustable rod shall be used for connection between rocker links and circuit controllers.*

(f) Circuit controllers placed below the floor and connected to tail levers shall be supported on a structure securely attached to frame supporting the machine.*

8. Conduit. (a) The structures immediately supporting electric locks** or circuit controllers over machine locking or below floor shall serve as a wire chase.*

(b) Flexible metal protected cable, to be approved by purchaser, shall be used between terminals and electric locks and levers. Cables shall be protected by pipe conduit fastened to front of levers and clearance afforded between levers and quadrants for conduit.

9. General. (a) Electric locks** and circuit controllers shall be securely fastened to supporting structure.

(b) Electric locks** and circuit controllers shall be readily accessible and arranged to permit of replacements or additions without interference.

(c) Bolts and cap screws shall have U. S. Standard thread.

(d) Nuts, bolt and cap screw heads shall be hexagonal.

(e) Bolts and cap screws shall be provided with lock washers.

(f) Lever latch when locked up shall be held within ¼ in. of the full unlatched position as measured on the lever by movement of the latch rod.

(g) Lever latch when locked down shall be held against raising more than ¼ in. as measured from the full downward position on the quadrant.

(e) Circuit controllers placed below the floor and connected to rocker links shall be supported on a structure so attached to the interlocking machine or supporting frame as to maintain a rigid and permanently fixed re-

10. Painting, 11. Packing, 12. Marking and 13. Warranty are standard sections.

Committee.—W. N. Spangler (Penna.), chairman; W. F. Zane (C. B. & Q.), vice-chairman; R. W. Taylor (B. & O.), vice-chairman, T. S. Adams (N. Y. C.), L. Brown (A. T. & S. F.), W. F. Cook (D. & H.), O. Frantzen (N. Y. N. H. & H.), Wm. Hiles (C. C. C. & St. L.), C. J. Kelloway (A. C. L.), H. F. Lomas (I. C.), W. B. Morrison (D. L. & W.), B. F. Oler (Penna.), E. J. Relph (N. P.), C. Smith (St. L.-S. F.), and M. Sutherland (Maine Central).

*Alternate requisites.

The Uses of Electro-Mechanical Interlocking

By P. A. Rainey,
Electrical Engineer, Telegraph and Signal Dept.,
Pennsylvania Railroad, Philadelphia, Pa.

IN THE earlier days of railroading, the switch operated directly by its ground lever and the hand or flag signal gave way, in many instances, to the grouping of switch levers, with pipe runs to the switches, and the operation of semaphore signals by pipe or, more often, wire connections. With the arrangements originally provided, where switch and signal operating devices had no connection with each other, signals were operated regardless of the position of the switches, switches were frequently thrown while proceed signals were displayed. The bolt-locking of switches by the signal connections, the interlocking of switch and signal operating devices and the use of facing point locking apparatus followed as results of derailments and other accidents.

Air-operated switches and signals, at first pneumatically and later electrically-controlled, and electric switches and signals of various types, came into use at terminals and other points where large numbers of switches and signals were involved. With the power-operated switches and signals came indication circuits, requiring electric locks or indication magnets on the operating levers.

Need for Electric and Mechanical Levers in Same Machine

Electricity was found more and more useful in switch and signal operation. Electrically-locked circuit controllers were used in some cases for the operation of switches and signals located remotely and in connection with "lock and block" or controlled manual block installations. These circuit controllers were sometimes mechanically interlocked with each other, but there was no practical method of interlocking them with the levers of the mechanical machines. The time was therefore ripe for the electro-mechanical interlocking machine, which combined electric and mechanical levers in such a manner that the full advantages of each could be realized and that levers of either kind could be locked mechanically with any other levers in the combined arrangement.

One of the first electro-mechanical machines installed was manufactured by the General Railway Signal Company, and was known as their Model 2-B. It was an application of the Model 2 unit lever type electric machine to the back of the frame and levers of a Saxby and Farmer mechanical machine, with the necessary parts for interconnecting the two types of levers. In this installation, the switches were operated by switch and lock movements, thrown by mechanical levers, while electric levers were used for detector and indication locking and also for signal operation. The rotary circuit controllers were arranged in the electric machine so that certain sections could, if desired, be operated from adjacent levers, or by the mechanical levers. The mechanical locking of all levers was accomplished in the vertical locking of the electric machine. This type of machine, with some modifications, is still available, arranged either for operation as above or with direct mechanical connections to switches and separate mechanical levers for facing point locks, using electric levers to lock the facing point lock levers.

Two Developments of Electro-Mechanical Machines

The earlier designs of electro-mechanical machines, manufactured by the Union Switch & Signal Company, have been quite generally superseded and should be of interest chiefly as stepping stones in development. The Style-P, originated as a complete machine, and the Style-S, as a separate lever unit, have passed through various stages, to the P-5 and the S-8, now offered as latest practice.

The P-5 machine, being a combination of the electro-pneumatic and the S. & F. machines, differs from the machine described above chiefly as the electro-pneumatic machine differs from the electric, the most important differences being the horizontal locking bed and three-position signal levers in the pneumatic as against the vertical locking and two-position signal levers in the electric. In the P-5 machine, using the horizontal electro-pneumatic locking, there is no provision for direct interlocking between the S. & F. levers, the locking between small levers and the S. & F.

levers being of the bolt-locking type. Experience has shown that there is seldom, if ever, any need of direct locking between mechanical levers in machines of this general type where signals are operated by small levers, and that, with the average track layout, there is some advantage in the three positions, "N," "R" and "L" of the small levers for signal control.

With these machines, S. & F. levers are generally used only for switches, operated by switch and lock movements, or for switches and facing point locks, where switches are direct-connected, and small levers are used for all signals, as well as for electrically locking the switch or facing point lock levers. Small levers are also used for operating switches which cannot be operated well mechanically.

A Style S-8 interlocking machine consists of a complete S. & F. mechanical machine, to which one or more S-8 units are attached, mounted on a supporting frame above the locking bed. The S-8 unit has a swinging push and pull lever, which, when mounted, extends downward just a few inches above the top of the S. & F. levers. Segmental bevel gears give a rotating motion to the horizontal shaft, which extends backward through the unit carrying the segments for indication and detector locks, the driver for vertical connection to the S. & F. locking bed, and either a 12-way horizontal spring combination or a gear for driving a vertical spring combination roller where more than 12 en care of in the S. & F. locking bed.

The Style S-8 interlocking machine can be made to serve any purpose and meet any conditions to which the other types of electro-mechanical machines can be adapted, but is especially applicable:

(1) Where a limited number of switch and signal units, located too far from the cabin for mechanical operation, are to be connected up for power operation, and where track layout is such that mechanical locking is desirable between the power and mechanical units.

(2) For application of detector and indication locking on existing mechanically-operated switches where it is considered satisfactory to continue the signal operation from S. & F. levers.

(3) For new installations where the track layout is such that the number of electric levers for switch indication, for signal operation and for remote functions, if any, is practically the same as the number of S. & F. levers required, while the use of other types of machines would result in a large number of spare electric levers or spaces.

As to the use of switch and lock movements, one S. & F. lever to operate and lock each switch, compared to direct switch connection, or one S. & F. lever to throw and one to lock each crossover, much might be said. Each arrangement has some advantages, and proper choice, in some cases at least, depends on local conditions. There is little difference in the actual lever operation, tests having been made which indicate that the maximum pull on the S. & F. lever is about the same in either case, this maximum coming slightly earlier in the lever stroke where switch and lock movements are used.

In connection with the use of switch and lock movements in electro-mechanical plants, there has been developed an electric lock for application to the movement. This locks the motion plate, except when current is supplied over proper contact on the small lever, and insures the integrity of the switch against jarring open, due to broken pipe lines, or against being pulled open, in the event of dragging equipment striking and bending the operating connections.

Discussion

W. N. Spangler (Penna.), Chairman: The committee presents two specifications under assignment (1).

It has been suggested that paragraph 3 be changed to read as follows: "Machine legs, bottom girders, lever shoes, mechanical lever quadrants, top plates, rocker links, bearings, end strips, counter-weights, locking brackets, also frames for supporting electric levers, locking, electric locks, spring combination, terminal boards and such other devices and equipment as may be connected directly to the electric levers, shall be cast iron."

The committee accepts the suggestion.

The committee recommends acceptance of the report for submission to letter ballot, superceding subject-matter in the Manual, and I so move.

Motion carried.

In Section 10—Q, it has been suggested that instead of the term "high boss" the word "dowel" be used, and that the dimension of the dowel be changed to ¼ in. diameter by 5/32 in., which will make the paragraph read: "Trunions for swing dogs shall be reversible, with ¼ in. x 5/32 in. dowel on base, and shall be provided with washer and cotter."

The committee accepts the suggestion.

Committee VI is now working on a drawing which may affect Sections 10-R and 10-S, relating respectively to the swing dogs and the straight locking dogs.

Mr. Spangler: One paragraph relates to the straight dogs, and Committee VI is working on a drawing to provide a drilling for straight dogs that will make it possible to use them universally, so that a man can take any kind of dog off one place and put a different kind of dog on that same place without plugging and redrilling the bars, and we may have to correct the dimensions to make it agree with their drawing.

R. B. Ellsworth (N. Y. C.): I think the point is well taken, if the specification is to be revised to comply with the drawing which is approved at this meeting, but if it is proposed to revise the specification to a drawing which is to be submitted at a later division and perhaps disapproved by Association, that would be a mistake.

Mr. Spangler: In answer to that, I would say, that we want to be as nearly correct as we can with that drawing when it is completed.

Mr. Spangler: I move that these specifications be accepted for submission to letter ballot to supercede material in the Manual.

Motion carried.

Mr. Spangler: Under assignment 2, prepare specification for the application of Electric Locks and Circuit Controllers to Mechanical Interlocking Machines Using I. S. & F. Locking, Specification 13826, the committee will eliminate the word "Improved in the designation for locking in this specification the same as in the two previous specifications.

The committee recommends acceptance for submission to letter ballot, and I so move. *Motion carried.*

Joint Report on Mechanical and Power Interlocking

A JOINT report on the factors which govern in determining the type of interlockings which should be installed was submitted by a joint committee consisting of the members of Committee II—Mechanical Interlocking and of Committee III—Power Interlocking. The committee recommended that the report be accepted for submission to letter ballot.

Factors Which Govern in Determining the Type of Interlocking Which Should Be Installed

1. **Location.** (a) Terminal. 1. Passenger. 2. Freight. (b) Main line. (c) Branch line. (d) Yard.

2. **Traffic.** (a) Volume. (b) Density. (c) Class.

3. **Proposed or existing signaling.** (a) Type. (b) Proximity to another interlocking. 1. Type. (c) Future development.

4. **Physical conditions.** (a) Track layout. (b) Surface subway or elevated lines. (c) Streets, industries, drainage, right-of-way or other special conditions or requirements. (d) Weight of rail, distance and or alignment between interlocking machine and units. (e) Space available in existing structures. (f) Location of existing structure in which machine may be placed with relation to plant to be operated.

5. **Cost.** (a) Construction. 1. Temporary. 2. Permanent. (b) Maintenance. (c) Operation. 1. Operation in connection with other duties of leverman.

Committee II—W. N. Spangler (Penna.), chairman; W. F. Zane (C. B. & Q.), vice-chairman; R. W. Taylor (B. & O.), vice-chairman; T. S. Adams (N. Y. C.), L. Brown (A. T. & S. F.), W. F. Cook, (D. & H.), O. Frantzen (N. Y. N. H. & H.), Wm. Hiles (C. C. C. & St. L.), C. J. Kelloway, (A. C. L.) H. F. Lomas (I. C.), W. B. Morrison (C. L. & W.), B. F. Oler (Penna.), E. J. Relph (N. P.), C. Smith (St. L.- S. F.), and M. Sutherland (Me. C.).

Committee III—F. W. Pfleging (U. P.), chairman; E. T. Ambach (B. & O.), vice-chairman; W. C. Sibila (N. Y. C.), vice-chairman; F. J. Ackerman (K. C. T.), T. A. Allan (C. N.), R. B. Amsden (I. C.), D. W. Fuller (A. T. & S. F.), T. Holt (Chgo. Union Sta.), J. H. Oppelt (N. Y. C. & St. L.), E. B. Pry (Penna.), C. D. Rex (Sou.), T. C. Seifert (C. B. & Q.), I. A. Uhr (St. L.-S. F.), O. R. Unger (M. P.), and G. A. Ziehlke (U. P.).

Discussion

W. N. Spangler (Penna.), Chairman: Under assignment 3, a joint report with Committee III is presented. This report appears exactly as presented at the West Baden meeting and the committee suggests acceptance for submission to letter ballot and I so move.

Motion carried.

Report of Committee I—Economics of Signaling

Of increasing importance to railway operating men are the possibilities of reducing operating expenses with signaling facilities. A number of studies have been made in order to assemble definite data dealing with estimated as well as actual savings. The report includes four examples of estimated savings that may be effected by replacing a manual block system with an automatic block system on five divisions of a railway, and also a comparison between actual and estimated savings on one of these divisions. The annual return on the investment over and above 6 per cent interest charges estimated for each division varied between 8 and 19 per cent.

B. T. Anderson, superintendent of signals, Chesapeake & Ohio, has been chairman of this committee since 1921.

B. T. Anderson
Chairman

THE committee submitted for acceptance as information, reports on the following subjects: 1. Estimated savings to be effected on five divisions of a railway by replacing a manual block system with an automatic block system; 2. Value of the train delay hour; 3. Economy of car retarders at hump and gravity yards, classification yards, and 4. A list of reports on economics of railway signaling.

Estimated Savings to be Effected on Five Divisions of a Railway By Replacing Manual Block System With Automatic Block System

The committee submitted four statements, A, B, C and D.

The content of each sheet was explained in the heading. All sheets refer to the same program of improvements on a railroad system, and as a whole the information worked up shows what was reported by the signal engineer of that system to his management. From Statement A the forecasted annual return on the investment over and above 6 per cent charges varies from a little over 8 per cent on one division to over 19 per cent on another division.

From Statement B it is to be noted that in the one installation made the forecasted results were more than realized.

Statement D makes deductions on a 100-mile basis and produces some basic units which are applicable to this particular improvement program when reduced to 100 miles of road. As tabulations of this nature are available from time to time, it is likely that basic units will be secured, derived from the average from such statements. Such units when secured should go a long way toward simplifying the matter of forecasting savings where automatic block supersedes manual block.

STATEMENT B
COMPARISON OF SAVINGS IN OPERATING COSTS ON ONE OF THE DIVISIONS SHOWN IN STATEMENT A

These savings were effected by actually replacing manual block system with an automatic block system Column A (Before)—Estimate of savings made before the automatic signals were installed. Column B (After)—Amount of savings computed from records made after the automatic block system was put into service.

	A (Before)	B (After)
Miles of road	148.2	148.2
Single track	139.3	139.3
Double track	8.9	8.9
Trains per day (average number)	34	34
Freight	22	22
Passenger	12	12
Automatic block system installation cost investment)	$593,000	$593,000
Interest on investment at 6%	$ 35,580	$ 35,580
Maintenance and operation expenses	39,124	28,368
Yearly expenses	$ 74,704	$ 63,948
Saving by reducing delays		
Overtime of train crews	$ 53,159	$ 41,736
Coal saved by less train hours	16,212	17,630
Saving by reducing number of train stops		
Wear and tear of equipment	20,099	28,470
Coal (stopping and starting)	14,670	21,352
Saving by reducing number of block and telegraph operators	40,296	50,572
Saving by reducing cost of lighting station and freight houses	1,260	1,260
Saving by eliminating switch lamps	1,428	1,430
Total gross savings per year	$147,124	$162,450
Less yearly expenses	74,704	63,948
Net saving per year	$ 72,420	$ 98,502
Annual return on investment, over and above 6% interest charges	12.2%	16.6%

STATEMENT D

ESTIMATE OF SAVINGS PER 100 MILES OF ROAD TO BE EFFECTED BY REPLACING MANUAL BLOCK SYSTEM WITH AN AUTOMATIC BLOCK SYSTEM

Cost of installation (566 miles)	$2,336,800
Net annual saving	362,706
Annual return on investment, over and above 6% interest charges	15.5%
Cost and Savings per 100 Miles of Road	
Cost per 100 miles	$ 412,862
Net annual saving per 100 miles	64,082
Trains per day, average number	30
Savings per 100 miles per annum:	
Train hours saved	9,134
Overtime hours saved	5,341
Train stops eliminated	21,316
Block operators released	20

Value of the Freight Train Delay Hour

The committee has had under consideration the money value placed by different railroads upon the saving made by a freight train delay hour. Some discussion has taken place as to the use of a value of about $21 to cover all classes of train service. This value cannot be used unless all the conditions incident thereto are understood. The committee has continued its study on this question and can only report progress. It has been found that the value varies from $5 to $25 on the various railroads and the average may be from $15 to $18. It is evident that a value must be used which will fit the operating requirements on a particular railroad. It is hoped that reports can be presented at future meetings which will indicate the value adopted by some of the railroads and which will cover the various classes of freight service involved in railway service.

Divisions	A	B	C	D	E	Totals
Miles of road	88	93	95.8	141	148.2	566.0
Trains per day, average number						
Freight	15	25	14	21.2	22	19.44
Passenger	19	6	8	8	12	10.6
Total	34	31	22	29.2	34	30.04
Automatic block signals						
Installation cost (investment)	$369,600	$396,000	$383,200	$595,000	$593,000	$2,336,800
Interest on investment at 6%	22,176	23,760	22,992	35,700	35,580	140,208
Maintenance and operation expenses	27,377	22,240	25,291	43,998	39,124	158,030
Yearly expenses	49,553	46,000	48,283	79,698	74,704	298,238
Estimated Savings Per Year						
Saving by reducing delays						
Overtime of train crews	25,101	28,223	23,042	32,400	53,159	161,925
Coal saved by less train hours	10,290	17,201	10,655	14,508	16,212	68,866
Saving by reducing number of train stops						
Wear and tear of equipment	19,162	23,725	7,300	50,356	20,099	120,642
Coal (stopping and starting)	14,171	17,793	5,329	37,773	14,670	89,736
Saving by reducing number of block and telegraph operators	38,640	31,920	29,189	52,080	40,296	192,125
Saving by reducing cost of lighting stations and freight houses	8,400	1,680	3,456	6,720	1,260	21,516
Saving by eliminating switch lamps	803	1,338	1,004	1,561	1,428	6,134
Total gross savings per year	116,567	121,880	79,975	195,398	147,124	660,944
Less yearly expense	49,553	46,000	48,283	79,698	74,704	298,238
Net saving per year	$67,014	$75,880	$31,692	$115,700	$72,420	$362,706
Annual return on investment, over and above 6% interest charges	18.1%	19.1%	8.3%	19.5%	12.2%	15.5%

Statement A—Estimated Savings to be Effected on Five Divisions of a Railway by Replacing Manual Blocking With Automatic Block System

Economy of Car Retarders at Hump and Gravity Yards

To secure economy in the cost of switching freight trains, and to avoid unnecessary delays at terminals and transfer points where a large number of cars are to be handled daily, most railroads have constructed yards in which cars are allowed to drift down a grade to the tracks assigned for their distribution.

Men are required: (1) To uncouple the cars; (2) to throw the switches to direct the cars to their proper tracks; and (3) to ride the cars for the purpose of applying brakes to prevent damage when cars reach and are coupled to other cars.

Further consideration of a possible increase in economy as well as safety in handling cars at hump yards led to the installation of power-operated plants for controlling the switches from central points, thus substituting a limited number of operators for a large number of switch tenders. At most of these plants the switches are pneumatically operated and electrically controlled. More recently, all-electric installations have been made.

Under the usual method of yard operation the extra energy of the cars after leaving the hump must be absorbed by the hand brakes. This braking varies with the weather, the height of the hump, the condition of the cars, brakes and rails, and the grade and curvature of the yard. The brakes may be used during the entire run of the car or just before stopping. This method is fairly satisfactory but car riders have been injured and cars and freight damaged. Weather conditions seriously affect the capacity of the yard and, due to the large number of men required, the labor cost of operation is high.

The most recent development in hump yard operation is the car retarder, a power-operated device for controlling the speed of cars from the ground after they leave the hump, thus eliminating the car riders. The car retarders are controlled from the plant controlling the power-operated switches. The first installation in the United States was made at Gibson, Ind., in 1924, on the Indiana Harbor Belt. They have been used in Europe since 1921.

The car retarder is a power-operated rail brake, built into the track, consisting of a number of iron shoes, suitably mounted, and which move with varying pressures according to the judgment of the operator, in such a manner as to grip both sides of the car wheel rims. The number and location of the car retarders

and operating stations will depend upon the track layout at each yard. In general, however, the first car retarder will be near the summit of the hump; others will be at intervals along the lead and on each classification track.

A skate machine, a power-operated device, located beyond the last retarder on each classification track, and controlled from a retarder station, is used to stop a car which has passed the last retarder without its speed sufficiently reduced to prevent damage on reaching its destination. Additional skate machines can be located at the far end of each classification track for establishing the head end of trains.

The operators operate the switches of the classification tracks, judge the speed of the cars, retard them when necessary by means of the car retarders, and operate the skate machines when cars must be stopped.

The use of the car retarder system may involve changes in yard design. In the usual hump yard the hump provides only such grade as will give sufficient speed to a bad running car to take it to the farthest point of the yard. With a car retarder system, steeper humps can be employed which permit higher working speeds and increased yard capacity. Where power switches are in use, present practice requires the control to be centralized in one station; whereas, in the car retarder system both the control of switches and car retarders for each portion of the yard, are located in the same station. In most cases, several stations will be required. In some cases, the present track layout will require a large number of car retarders to handle traffic; whereas a slight rearrangement of tracks and switches will permit the same amount of traffic to be handled with fewer retarders. It is too early in the development of car retarders to secure complete data as to their economic value. Cost data of an original installation were shown.

Committee—B. T. Anderson (C. & O.), chairman; G. S. Pflasterer (N. C. & St. L.), vice-chairman; E. B. DeMeritt (C. of G.), W. J. Eck (Sou.), W. F. Follett (N. Y. N. H. & H.), H. F. Haag (K. C. S.), R. B. Jones (C. P.), W. M. Post (Penna.), J. E. Saunders (D. L. & W.), R. T. Scholes (C. B. & Q.), and B. J. Schwendt (N. Y. C.).

Problems Encountered in Economic Studies

B. J. Schwendt, assistant signal engineer of the New York Central, Cleveland, Ohio, presented a lengthy paper on the subject of "Some of Our Problems in the Economics of Railway Signaling." This paper pionted out that by the term "railway signaling," is meant signals and interlocking of any and all kinds as may be necessary to produce the desired operating results in a given territory most economically. Expanding on this statement Mr. Schwendt explained how signal departments had been developed through the past years. He stated that about four-fifths of the railroad mileage of the United States is single track and that it therefore follows that the operating and economic possibilities of signaling on this mileage are most important. Mr. Schwendt spoke of the increased efficiency being accomplished on numerous roads by arranging that the chief signal officer report directly to the operating vice-president or general manager, thereby making it possible for the signal department to enter into the operating problems of train operation. Mr. Schwendt touched on the developments of the car retarders in classification yards and also on train control, pointing out that although the signal officers had an important part in such dedevelopments that the co-operation with mechanical and engineering officers was of prime importance.

Discussion

B. T. Anderson (C. & O.), chairman: The first report is on estimated savings to be effected on five divisions of a railway system by replacing manual block system with automatic block system. It will be noted that the annual return on the investment over and above the 6 per cent interest charge varies from about 8.3 per cent to 19 per cent. The statement shows a comparison of savings in operating costs on one of the divisions shown in Statement A before the automatic system was installed and after the automatic signals were installed.

There has been a noticeable feeling among certain people that the savings estimated by the committee and by signal departments were not in keeping with the facts. In fact, it was thought that these savings had been over-estimated. From the cases that have come to the attention of the committee, we feel that the opposite is the case; that these estimates are low and in reality the actual saving is higher than that given. In this particular case the saving was estimated at 12.2 per cent and the actual result was 16.6 per cent. On Statement D is shown the estimated savings per 100 miles of road.

The committee had under consideration the money value placed by different railroads upon the saving made by freight train delay hours. Some discussion has taken place as to the use of the value of about $21 to cover all classes of train service. We find that the railroads use a value anywhere from $5 to $25 and the average may be from $15 to $18.

Divisions	A	B	C	D	E	Totals
Miles of road	88	93	95.8	141	148.2	566.0
Freight train miles per day	1,365.2	1,912.9	1,341.2	3,060.9	3,260.4	10,940.6
Freight train hours saved per day	22.5	37.3	13.33	31.8	36.71	141.64
Freight train hours saved per year	8,212.5	13,614.5	4,865	11,607	13,399.15	51,698.15
Overtime hours saved per year	4,681.91	5,229.65	4,315	6,067.41	9,936.24	30,230.21
Train stops eliminated per year	19,162	23,725	7,300	50,365	20,096.9	120,648.9
Telegraph operators released	23	19	17	31	23	113

Statement C—Showing Details of Estimated Savings to be Effected on Five Divisions of a Railway as Shown in Statement A

C. H. Tillett (C. N.): Regarding the elimination of switch lamps, does that really mean the switch lamps were eliminated or changed to electric lighting?

B. T. Anderson: It means the switch lamps were eliminated.

W. F. Follett (N. Y., N. H. & H.), sub-committee chairman: In opening the subject of the economy of car retarders at bump and gravity yards, I would

like to emphasize the salient points covered by your committee's report. To secure economy in switching freight trains, gravity yards have long been used. The operation of such yards require men first, to uncouple the cars, second, to throw switches for the classifying, and third, to ride the cars for the purpose of applying the brakes. As a matter of economy for some years, power operated switches have been used, thus eliminating that need of labor.

Under the usual method of operation, the extra energy of the cars has been absorbed by hand brakes. This braking varies with the weather, the height of the hump, the condition of the cars, brakes and rails, and the gradient and curvature of the yard tracks. The most recent development in hump yard operation is the car retarder, a power-operated device for controlling the speed of cars from the ground after they leave the hump, thus eleminating the car riders.

Comparative Costs of Classifying Cars by Hand Braking and by Car Retarders

Items	Month of February 1924-1925 1924—Hand Braking 1925—Car Retarders Operating				Month of March 1924-1925 1924—Hand Braking (see note *a*) 1925—Car Retarders Operating			
	Quantities		Costs		Quantities		Costs	
	Feb. 1924 *b*	Feb. 1925	Feb. 1924 *b*	Feb. 1925	Mar. 1924	Mar. 1925	Mar. 1924	Mar. 1925
1 Cars humped	42,534	45,283			48,770	51,556		
2 Average number per day	1,467	1,617			1,573	1,663		
3 Mean temperature	30°	30°			36°	37°		
4 Engine hours	1,840	1,338	$19,320.00	$14,049.00	1,388	1,219	$14,574.00	$12,799.50
5 Conductor hours	696	648	577.68	537.84	744	709	617.52	589.09
6 Switchmen hours *c*	14,192	2,787	10,927.84	2,145.99	13,424	2,517	10,336.48	1,908.09
7 Switchtender hours	3,480		2,053.20		3,720		2,194.80	
8 Hand-brake testers hours	58		400.00		62		400.00	
9 Retarder operator hours		3,360		3,124.80		3,513		3,267.79
10 Messenger service hours		280		122.50		310		135.63
11 Maintenance of plant				1,758.05				2,974.39
12 Power for plant				1,124.73				787.24
13 Personal injuries			2,263.00 *d*	55.25 *d*			2,263.00 *d*	55.25 *d*
TOTAL COSTS			$35,541.72	$22,918.16			$30,385.80	$22,546.98
Average cost per car humped			83.5¢	50.6¢			62.3¢	43.7¢
Average saving per car				32.9¢				18.6¢
Saving 1925 over 1924 (45,283 cars x 32.9¢)				14,898.11 *e*	(51,556 cars x 18.6¢)			9,589.42 *e*

a. Car retarders were installed and in partial operation during month of March, 1924.
b. 29 days in February, 1924.
c. Includes car riders.
d. Average amount per month.
e. Interest, depreciation, taxes and insurance not taken into account as data not available.

B. T. Anderson: I would like to call on representatives of two of the companies who are manufacturing this apparatus for a few remarks.

C. W. Prescott (G. R. S. Co.): I think we have always found that where we can so arrange a man's work that he can do it without any personal risk to himself, he carries it out better and he can carry out more of it. I think the development of the car retarder is along the same lines that we have been following in other developments. Some yardmasters consider it necessary, for instance, to have a hand brake tester. When the train comes up over the hump, each hand brake is tested before the riders get on. Such work is eliminated by the use of the retarder. The car rider himself is, of course, eliminated, as is also the necessity in many yards for placing a skate or skid in case of emergency to prevent the car from overrunning.

The control of the speed of the cars by car retarders requires the operator to see what effect the retarders are having. He is located with a small area of control near him, and that means that there may be four or perhaps five different towers in one yard, each man controlling his own area and handling the movement of cars through that area.

Mr. Anderson: W. B. Rudd, of the Union Switch & Signal Company.

W. B. Rudd (U. S. & S. Co.): As an economic proposition if this elimination of car riders, switchmen and those other men, which is absolutely saving in money, results in earning a favorable, not a large, but a favorable percentage on the investment, then it is certainly worth while studying in detail the possibilities of application of a car retarder to a given yard.

The neutral, non-accelerating grade through a classification tracks is important. Therefore, the first thing to do is to take the hump yard that you have and from a study of the profiles ascertain what yard nearest approaches this non-accelerating grade. Next, find out what it would cost to put in car retarders and if these other factors give a saving, put them in. When you eliminate the car rider, you also eliminate any injury that he may sustain. All of those other factors are bound to result in savings, which of course, will be partially offset by the cost of maintenance.

We have enough data to make car retarders, we think, very much worth while in some yards, and very likely, as we get more installations and complete economic data, they will be just as attractive in other yards.

Mr. Chairman, I move that the reports given be accepted as information.

Motion carried.

Chairman Post: I notice several superintendents over there, Mr. Derbyshire, Mr. Brown and some others. We will be very glad to hear from them.

F. M. Brown (P. & L. E.): I have been much interested in the papers this morning and this afternoon, and particularly the one on the operation of a piece of single track by means of signal indication. The gentleman who presented that paper stated that he believed the Signal section could provide any sort of signals to meet any situation. I believe that such is the case.

Chairman Post: We would like to hear from others. Mr. Derbyshire, will you say a few words?

G. J. Derbyshire (C. & O.): I have a railroad that is uphill both ways, one per cent grades. Our average miles per car for the month of February, per serviceable car for the month of February, was 105.9. I think that is about as fast as they move them anywhere in the country. The average miles per hour per crew time for all trains is 14. They run as high as 17. I have not a signal on except manual block signals. There is not a lap siding in it. Every switch that is handled is handled by a brakeman.

Operation of Trains by Signal Indication

By T. W. Cheatham
Division Superintendent, Missouri Pacific,
Osawatomie, Kan.

SEVERAL years ago it became apparent that additional facilities would have to be provided in order properly to handle the rapidly increasing traffic on the 52-mile single track subdivision between Kansas City, Mo., and Osawatomie, Kan. Practice had made it a rule on some railroads that when traffic had outgrown single track, continuous double track was built, frequently in short sections, which failed to provide the necessary relief on account of varying operating conditions. Owing to the fact that the traffic which overloaded this line was seasonal, beginning in July, reaching the peak in September and October, and together with the high cost of building continuous double track, it was decided that other means of expanding the line must be considered.

Scientific traffic studies by the signal engineer and the operating officers developed that by a rearrangement and proper spacing of existing sidings, the building of new sidings, the installing of signals and remote control switches and the interlocking of railroad crossings, thereby speeding up train movements, that the capacity of this line could be increased so that the building of continuous double track would be unnecessary—at least it could be postponed for several years.

This district was selected by the management for the first installation of automatic train control, and this selection influenced the decision to operate trains by signal indication. Wherever possible to do so, the sidings were rearranged as lap sidings, the inner switches being handled mechanically and the outer switches by remote control; at all such points No. 20 turnouts were installed to permit of high speed train movement, when entering and leaving sidings.

Method of Operation

Time-table superiority of trains was superseded on this subdivision after the signaling was placed in service, by application of Controlled-Manual Block System Rules 401 to 465-a. The Manual Block System rules remain in effect subject to provisions of Rule 405-a. Regular block sheet records are maintained at each of the block station by the signalmen.

All block signals are interlocked so that it requires the co-operation of both signalmen to manipulate the signals, thus providing a check against errors; and in addition, signals are held at stop by the presence of a train in the block.

Indicators in the block stations keep the signalmen informed of the location of trains as they advance from section to section in adjacent blocks; this information is of great value to dispatcher in figuring meeting and passing points. The train dispatcher directs the movements of trains, by advising the signalmen what disposition is to be made of trains at meeting and passing points, taking advantage of his knowledge of which train should have preference, etc.

All information relative to train movements is transmitted to the enginemen by signal indications, no written orders being issued except for the purpose of establishing the identity of trains; the one exception to this being when work train extras are working within defined limits. Work extras are handled on the form "H" work order in the usual manner, limits being confined to a single block section. Trains in either direction are then permitted to enter the occupied block against a stop indication of block signals by the use of a permissive card.

Meeting points are protected at block stations by:
(a) Manual block signals.
(b) Controlled manual block signals (semi-automatic).
(c) Automatic train control.

Meeting points at intermediate or blind sidings are protected by:
*(a) Manual block permissive card.
(b) Controlled manual block signals.
(c) Automatic train control.

Excellent Results Obtained

The greatest benefit derived from handling trains by signal indication is that the trains that are moving can be kept moving. Movements can be arranged quickly, and in many instances the entire movement can be completed before it could be arranged for under the old method of train rights and train orders. For example, a tonnage train east formerly required 45 min. to pull out of the siding, at Flagstaff, close the switch, go to Bucyrus, a distance of 6.44 miles, take a siding and clear an opposing train. Under the present method of handling, the same train pulls out of the siding and clears at Bucyrus in 20 min. In many instances trains meet on the lap sidings, neither train stopping, nor reducing speed to any extent.

The design of the circuits and an explanation of the apparatus used in signaling this line are fully explained in an article in Railway Signaling of November, 1924, page 453, and another article covering the operation appeared in Railway Signaling, February, 1926, page 55.

The following is a comparative statement of the speed per hour and gross ton miles per train hour for the months of October, November, December and January:

Month		Miles per hour	Increase	Gross ton miles per train hr.	Increase	Per cent
October	1924	9.81	.....	18,499	.....	.....
	1925	12.03	2.22	22,370	3,871	20.9
November	1924	11.19	.....	20,324	.....	.....
	1925	12.09	.9	23,276	2,954	14.5
December	1924	10.59	.....	20,297	.....	.....
	1925	12.25	1.66	22,997	2,700	13.3
January	1925	10.2	.....	21,488	.....	.....
	1926	12.19	1.99	25,410	3,962	18.5

The following is comparative statement of fuel consumption per thousand gross ten miles for the months of October. November, December and January:

*Special form permissive card is used in connection with intermediate siding meeting points, principally to designate which train holds main track at meeting point.

Month		Per thousand Gross ton miles	Decrease	Per cent	Saving in money
October	1924	198.4			
	1925	185.1	13.3	6.7	$1,488.00
November	1924	206.6			
	1925	190.6	15.8	7.6	1,566.00
December	1924	219.2			
	1925	204.4	13.8	6.3	1,244.00
January	1925	211.5			
	1926	186.6	24.9	11.8	2,518.00

Discussion

Chairman Post: It was my good fortune a few months ago to take a trip over the Missouri Pacific and wtness the installation of a controlled manual block signal system.

T. W. Cheatham (Mo. P.): The chart that is about to be shown on the screen has been printed both in the *Railway Age* and in *Railway Signaling.* The design of the circuit and explanation of the apparatus used in this signaling are explained in an article in *Railway Signaling* of November, 1924, page 453, and another article covering the operation appeared in *Railway Signaling* for February, 1926, page 55.

T. S. Stevens (A., T. & S. F.): I would like to ask Mr. Cheatham how he issues instructions.

Mr. Cheatham: By word of mouth.

Mr. Stevens: That was the way I always thought they should be; they should be made over a telephone. When we put our stop system into effect, it brought about the same result as this, excepting in those days there was no remote control. The superintendent insisted on issuing written instructions to the operator simply to have something on file as to what he did.

Mr. Stevens: Mr. Cheatham has brought out the idea that we must have double track, has been exploded to some extent by this operation on the Missouri Pacific.

Mr. Cheatham: We don't take the position that this will entirely eliminate the double track idea, but there must be somewhere a stepping stone or a transit period from single to double track. We feel that the estimate on double track, while it wasn't so expensive, $2,000,000 meant a great deal several years ago to any railroad, especially to any Western railroad. We felt that something should be done to take care of the period from single to double track.

Now if we have postponed the building of double track with an investment of three, we will say three and one-half million dollars, this means we at least have saved the interest on $2,000,000 for six or seven years. This whole installation is put in with the idea of fitting into a double track arrangement. The sidings, as nearly as we could do it, are all located in curve territory and all that it needs to do is to be straightened out and the material removed, recovered and put some place else. We may not have eliminated entirely the possibility of having to go to double track.

Mr. Cheatham: I will say that I believe I was with the Missouri Pacific when they installed their first automatic block signal. This is a good many years ago and we now have several miles of block signaling. I have never seen anything that was as interesting as the development of block signal operation on a railroad. I would rather spend money for signals to move trains than sidings to delay them. I believe there is a good deal to that. Of course, there is a common ground on which everybody can meet. I don't think any railroad ever makes a mistake by spending money for signals and I firmly believe that any railroad can get anything they want from the signal operations if they are willing to spend the money for it. That is our view about signaling.

Report of Committee X—Signaling Practice

A comprehensive view of the subject of automatic train control formed the basis of this committee's report. It is a continuation of the previous reports and includes information on the mileage of the first I. C. C. train control order. Information with reference to the orders and reports of the Commission were also given in detail. An analysis of railroad train accidents, taken from reports of the Interstate Commerce Commission brings out the fact that train control can be of benefit in eliminating only a very small proportion of the railroad accidents. The tables and diagrams show clearly that the railroads are following methods and practices which tend constantly to decrease the accident. F. B. Wiegand, signal engineer, New York Central, has directed this committee for three years.

F. B. Wiegand
Chairman

THE committee submitted a report on automatic train control.

The committee has considered the other assignments and submitted the following with reference thereto: 1. Revision of Manual. This subject-matter has been given consideration. 3. The advisability of controlling from a central station all switches at a given railway terminal, and the extent to which such control can be carried in non-terminal territory. Report on this subject-matter was submitted at the 1925 stated meeting and there accepted as information. 4.The effect on track capacity by shortening the length of blocks in automatic territory, using Indication 501-E as given in the standard code. This subject-matter has been given considerable study, data have been collected and it is expected report will be ready for submission at the next meeting of the Signal section. 5. Report on noteworthy advances in signaling practice. A report on this subject was submitted at the 1925 annual meeting. The committee has nothing further to submit at this time.

EXPLANATORY

With reference to Assignment 2.—Automatic Train Control. A report on this subject was submitted at

the 1925 stated meeting and, previous to that, at the 1925 annual meeting. The report submitted at this meeting is intended as a continuation of the previous reports and in it were given the mileage of the first I. C. C. order; permanent installations completed or in service; permanent and preliminary installations under construction; contracts executed; devices selected by carriers in the first order, and such other information as the committee thought would be of interest to the members.

(The majority of the information in the report as to the developments of different systems of train control and different orders and reports of the commission have been published currently in the *Railway Age*. The status of the different installation was given in the *Railway Age* for January 2.—Editor.)

Analysis of Accidents

Work on the analysis of accidents investigated by the Interstate Commerce Commission as published in the annual accident bulletins is being continued by the Committee on Automatic Train Control of the American Railway Association.

Accident bulletin No. 93 for the year 1924 which has recently been issued contains its usual statistics regarding railway accidents, and some analysis has been made of those accidents which it would appear possible might be affected by train control. Before, however, stating these tabulations, the method in which the I. C. C. bulletins are prepared may be of interest.

Accidents are separated by the commission into several divisions and sub-divisions. There are three primary classifications:

I Train accidents, those resulting from the operation of trains, with or without casualties, and a railroad property damage exceeding $150.

II Train service accidents, those resulting from the operation of trains resulting in casualties to persons and a property damage less than $150.

III Non-train accidents, those not directly caused by the operation of trains, but such as result from shop operations, handling freight and materials, maintenance of way, etc.

The first class, that of train accidents, is again subdivided into collisions, derailments, locomotive boiler accidents, other locomotive accidents and miscellaneous. They are, therefore, those which result directly from train operation.

Train service accidents are classified under various headings, and generally include those to employees in the regular performance of their duties, such as those resulting from coupling and uncoupling cars, the operation of locomotives and of switches, accidents at highway crossings are included in this heading.

The province of train control may be stated to be exclusively in the field of collisions. While it may be effective in preventing a limited number of other accidents, such as some derailments, its primary purpose is to prevent collisions, and, therefore, the analysis of those accidents classed under the heading of "Collisions" would seem to give all the information of value to train control problems, which can be derived from a study of accidents. Further, trespassers may be eliminated from consideration, as it would seem to be evident that the railroads should not be called upon to spend large amounts to avoid injury to those who wilfully expose themselves to injury, often in the face of direct and positive warnings. After excluding certain classifications of collisions, as will be noted later, there will undoubtedly still be some accidents which cannot be prevented by train control as ordinarily proposed and understood. These may be said to offset the accidents from other causes that train control would prevent, so that the investigations may be narrowed down to a certain number of the collisions.

In order to show the relations of these different classifications of accidents, Table A has been prepared from the tables given in I. C. C. bulletin, showing the reportable accidents of all classes:

The tables—A to E inclusive, give the accidents, in which there were casualties, due to train operation, together with the damage to railroad property.

Referring to the tables, it seems reasonable to exclude switching collisions from this number, which gives a total of 1,825 collisions, 79 deaths and 1,581 injuries, with a railroad property damage of $3,363,354, as the final record of accidents subject to correction by automatic train control. Doubtless a number of those would be excluded by a study of the causes in each case, but the necessary information is not available from Bulletin No. 93. As many of these were investigated by the Bureau of Safety, some conclusions might be drawn by a careful study of the published summary of such investigations, though a complete analysis can only be made by a search in the records of the commission.

Table-E gives a different classification of collisions, and a study will lead to approximately the same conclusions as for Table D. In C, yard collisions should quite obviously be eliminated, and doubtless there are a number of others, especially under freight train operation, such as those at slow speed, those due to runaway cars, etc., that should be eliminated in any discussion on train control. Only a study of the records, as stated above, can give even an approximately conclusive answer. All these tables show the small part that train control can possibly take in the reduction of accidents due to railroad operation, even when all roads are equipped and devices are operating as intended.

An appendix to Bulletin-93 shows the accident record for a number of years, and while there is an increase in the total number of casualties, the number per transportation unit is greatly reduced. For instance, for the fiscal year ending June 30, 1889, 1 employee was killed for each 357 employed; whereas for the last calendar year 1 was killed for each 1,164 employed, which is the best record yet made. For injuries, these figures are 14 and 35 respectively. For the first period named, 1,523,000 passengers were carried per passenger killed, and for the last period 6,314,000 passengers were carried. This is the best record except for 1923. The figures for injuries are 220 and 176, which is the best record, except for 1921.

Committe.—F. B. Wiegand (N. Y. C.), chairman; B. T. Anderson (C. & O.), vice-chairman; H. S. Balliet (N. Y. C.), W. E. Boland (S. P.), W. J. Eck (Sou.), W. H. Elliott (N. Y. C.), G. E. Ellis (A. R. A.), J. V. Hanna (K. C. T.), J. C. Mock (M. C.), H. G. Morgan (I. C.), F. P. Patenall (B. & O.), J. A. Peabody (C. & N. W.), F. W. Pfleging (U. P.), W. M. Post (Penna.), A. H. Rudd (Penna.), T. S. Stevens (A. T. & S. F.), E. G. Stradling (C. I. & L.), W. M. Vandersluis (I. C.), R. C. White (M. P.).

Discussion

A. H. Rudd (Penna.) Concerning the summary of the accidents that might be prevented by train control through automatic stops, in the last few weeks we have had developments which have made me feel that a lot of us ought to talk out in the meeting. It may start something, but I think it is time for it. The Interstate Commerce Commission asked in 1903

to have a bill passed requiring the railroads to put in block systems and presented that bill for 17 years, which finally culminated in Section 26 of the Interstate Commerce Act. If we had had our block signals in, and our signals were anywhere near what they are

Table A—Casualties for 1924—Steam Roads

	Total	Rate per Million Locomotive Miles	In Train Accidents	In Train Service Accidents	Non-Train Accidents
Non-Trespassers					
Killed	3,659	2.12	328	3,331	.....
Injured	45,518	26.38	3,928	41,590	.....
Trespassers					
Killed	2,556	1.48	39	2,517	.....
Injured	2,853	1.65	58	2,795	.....
All Persons					
Killed	6,215	3.60	367	5,848	402
Injured	48,371	28.03	3,986	44,385	95,368

Table B—All Classes of Accidents

	No. of Accidents	Rate per Million Locomotive Miles	Killed	Per Cent	Injured	Damage to Railroad Property
Non-Trespassers						
Collisions	5,166	2.99	103	2.5	1,808	$ 5,077,059
Derailments	14,259	8.26	150	3.7	1,906	16,538,877
Locomotive Boiler Accidents	46	0.03	25	.6	53	275,677
Other Locomotive Accidents	756	0.44	....	.....	20	352,141
Miscellaneous	2,141	1.24	50	1.3	141	1,081,626
Train Service Accidents	46,829	....	3,331	33.0	41,590	.....
Non-Train Service Accidents	....	....	402	9.9	95,368	.....
Total	69,197	....	4,061	100.0	140,886	$23,325,980

Table C—Accidents Involving Casualties

	No. of Accidents	Per Cent	Killed	Per Cent	Injured	Per Cent
Non-Trespassers						
Collisions	509	41.0	103	31.4	1,808	46.1
Derailments	604	49.4	150	45.8	1,906	48.3
Locomotive Boiler Accidents	26	2.1	25	7.6	53	1.4
Other Locomotive Accidents	12	0.9	...	.....	20	0.6
Miscellaneous	83	6.6	50	15.2	141	3.6
Total	1,244	100.0	328	100.0	3,928	100.0
Trespassers			2,556		2,853	

From the above table, the collisions have been separated as shown in the following tables. These have been separated into different classes for the purpose of future classifications:

Table D—Collisions—1924

	No. of Train Accidents	Killed	Injured	Damage R.R. Property
Rear end	407	27	723	$1,077,952
Head on	206	40	532	1,147,149
Broken train	179	..	6	130,719
Side or raking	435	2	1	528,485
Collisions at railway crossings:				
On private rights of way	50	..	19	77,498
On public streets, etc.	8	..	4	3,876
Trains with car not in trains	120	8	99	116,317
Switching	3,341	24	227	1,714,305
Not elsewhere classifiable	420	2	54	281,358
Total	5,166	103	1,808	$5,077,659

Analysis of Accidents as Published in I. C. C. Bulletins

now, I don't believe there would ever have been any call for automatic stops.

Today 40 per cent of the railroads are not block signaled, and according to the Interstate Commerce Commission statistics, over 60 per cent of the collisions occur on that 40 per cent of non-block signaled railroad, and those lines are not the lines of heaviest traffic. There are no statistics to show what the mileage really is, but I think we would be safe in saying that 80 per cent of all the passenger trains run on the 60 per cent that is block signaled, and that the other 20 per cent are those involved in over 60 per cent of the accidents. A number of the roads are reporting in the I. C. C. statistics block installations and operations that are not manual block.

In 1923 or 1924 there were 17 head-on collisions reported in manual block territory, 12 of which were due to over-run meeting points on absolute block; this means that they had forgotten about the block system and had met between block stations on orders. That is not a block system.

Mr. Post, the chairman has spoken about the confusion now existing with all the various types of automatic stops and speed controls and it will probably get worse unless this association can do something. I think the public, including the I. C. C., and the railroad men themselves are entitled to the information that we have on this subject of train control.

I am absolutely convinced from what I have been through that there are dangers in connection with the automatic application of brakes on heavy freight trains and on others, which are serious. Nearly every train is braked in a different way and has to be. The automatic braking device brakes it in the same way.

I believe that a cab signal of two or three indications, preferably three, one on the engineman's side, one on the fireman's, with a whistle that will sound on every change to a less favorable indication, and continue sounding until recurrently acknowledged by the engineman, and if he is disabled or unable to do anything, by the fireman, is the answer to this entire problem. I have analyzed every accident and collision that we have had in our automatic block territory and there isn't one of them that would not have been prevented by such a device.

We have heard considerable lately about the great economies to be effected by putting in speed control and then cutting out millions of stops, or thousands of stops. I believe those figures that are given are correct. There is no reason to think they are not. It shows the heavy traffic. But I am thinking perhaps some roads would eliminate more stops than there are trains, and that some roads will save so much by eliminating the stops that it would represent more than their net earnings.

There is a simpler and cheaper way of attaining the same result, and that is by printing a general order letting the trains pass "stop and proceed" signals without stopping, and it doesn't cost nearly as much as speed control. The rule covering that movement provides that the train shall stop and then proceed carefully. It is in two parts: The stop is supposed to enforce the second part of the rule which requires the slow movement, and it will do it with a tonnage train on up-grade, but it won't necessarily do it with a heavy train on a down-grade, and in fact such a stop may result seriously.

I have felt for a number of years that the answer is to let the trains go by, change your stop and proceed indication to a permissive indication and let the trains pass these signals at slow speed, and you can do it just as safely under 15 miles an hour without the stop as you can with it, without speed control as you can with it, because if your speed control is effective, you can run 15 miles an hour and you can get in then at that speed. Accidents above that speed are very infrequent, and result from the engineman missing his signal, which your cab signal would take care of.

I know that there are some men in the association

who agree with me. The result of the hearings that the D. L. & W. and Union Pacific and some other roads on the recurrent acknowledgement, brought out that those men felt that the cab signal was the answer. They didn't bring it out in that way, they didn't bring it out to emphasize it, but all through the testimony, every once in a while the cab signal would bob up. Therefore, I want to say that I believe that order 13,413 was a splendid thing. The I. C. C. for years had been asking us to do things and we had not done anything. Finally they sprung the order. We never would have had the cab signal if it hadn't been for that order, and I believe it is the greatest invention we have developed out of the whole business.

I move that the Committee of Direction be asked to appoint a Special Committee or to refer to Committee X or Committee I the question of investigating the utility of cab signals under the heading of other safety devices, provided in Section 36 of the Interstate Commerce Commission law. The utility of these cab signals is a substitute for the automatic stop or for speed control and also to investigate other safety devices, what the effect would be if we had a block system on all the lines of the country and if the present so-called block system were actually made such.

Motion carried.

A Discussion of Education

INCLUDED in the report of Committee V, Instructions, were two papers on the subject of Education, one by E. H. Freeman, professor of Electrical Engineering, Armour Institute of Technology, and the other by L. L. Park, American Locomotive Company, Schenectady, N. Y. Mr. Freeman's remarks will be presented in a subsequent issue. The paper of Mr. Park's is presented in part as follows:

Problems in Employee Training

L. L. Park,
American Locomotive Co., Schenectady, N. Y.

ANY training course in which your group is interested should include two separate elements, one involving some form of educational work or school program which imparts the information related to the trade and aids in mental development and another which gives practical experience and provides for manual skill in the operations of the trade.

Any thorough course of training, however, will involve five elements: (1) The acquiring of information; (2) The learning of certain processes or arts; (3) The forming of useful mental habits; (4) The development of latent talent or of native ability; and (5) The strengthening of self-reliance and dependability.

In arranging the school program two chief methods are recognized; first, the individual method, where each student works independent of the progress of the others, and second, the group or class method by which the entire group makes progress together. Each method has its advantages.

Our experience has shown that for students who are inclined toward mental activity or who have a fairly well cultivated taste for study, the individual method has decided advantages. These are, chiefly: (1) Each student is thrown upon his own resources in pursuing his course; (2) The faster students are not held back by the slower students; (3) The work done by each is more thorough, as he is not apt to hurry his work to keep up with the class; (4) The mental habits resulting from individual work are stronger than from group operation; and (5) The course may be varied where necessary to suit individual needs.

This method operates to best advantage where it is possible to have a number of students studying under the direction of an instructor who is available for giving help in getting over the tight places in the course of study. Such supervision permits of the stirring up of backward students of those whose interest is diverted to other matters; it is possible to check and correct the mental habits of the students and steer them into right channels; it is possible to determine the extent to which the principles underlying the study are understood and how they are being applied in further study. While it is possible to use the individual method in correspondence courses for those scattered over a large area, there are certain disadvantages in the correspondence plan which makes it less desirable than the supervised study plan.

Personal Contact is Important

Whenever it is possible to get students together for a study period under personal supervision, the individual plan will be found to operate to best advantage and give sufficiently better results to warrant the added cost of operation. Where it is not possible to get students together frequently, a traveling instructor who can call on students or be made available for consultation is an excellent alternative. Nothing can take the place of personal contact and the opportunity to ask questions will insure clearer understanding than all the written documents produced.

The class or group lecture method of instruction is adapted to students who require greater incentive to study or whose study hour is necessarily found when they are physically or mentally fatigued. For such students to plod along alone in individual study is apt to result in waning interest and unsatisfactory progress. They need the stimulus of class room teaching, the association of others who are similarly situated and the definite steps in learning which the class periods provide. The teacher must be active, resourceful and patient and must use all possible means of making clear the subjects taught so that the students will follow closely and cover the required ground together as well as possible.

Where a combination of these two methods of study is permissible the results are very satisfactory. We have found it possible in some of our training courses to use both the individual and class programs with very good results. Some subjects will be covered by the first method, others by the second. The decision as to which subjects shall be presented by each method will depend upon the purpose of the subject. When the subject offers opportunity for personal development through its use, the first method is preferred; where information chiefly is involved (as in related

subjects not vital to the program) the lecture method may be used.

Texts for use in individual or class study should, when possible, be "home made" or prepared specially for the purpose for which used. This not only improves the value of the information imparted (in that it is directly useful to the student or is applied to his industry) but it adds to the interest of the text.

No method of construction is complete without a proper series of problems which will compel the student to use the information given him and learn to apply its fundamental principles. The ability to analyse problems, determine the process needed to find a solution, secure needed data and obtain a rational and accurate answer is one of the most desirable results to be expected from a course of instruction. Problems calling for a choice between certain alternatives or a selection from possible courses of procedure are excellent helps in the development of judgment and the ability to decide important questions. Problems in discovering the causes of trouble, reasons for failure of parts and the finding of remedies for them are all desirable parts in the program.

Special Report on Friction Tape

Committee IX, Overhead and Underground Lines, submitted a special report which was not previously scheduled on the program, covering friction tape for railroad use, copies of which were distributed at the convention. G. Dryden (B. & O.), vice-president of the committee, presented a report explaining that it was the intention to standardize on one specification for friction tape to be accepted by not only the Signal section but the Electrical section and the T. & T. section of the American Railway Association. It is understood that approximately 90 per cent of the tape used by the railroads is consumed in signal work and that the other sections are ready to adopt the specifications as now presented by the Signal section with the idea that one kind of tape can be used by all departments of a raliroad and, therefore, simplify the purchasing and distribution of this material. The new specification submitted at this time is a revision of specifications previously incorporated in the Manual of the Signal section and was presented for discussion. However, in view of the fact that it is highly important that these specifications become effective as early as possible it was moved and carried that these specifications be accepted for submission to letter ballot for inclusion in the Manual.

Signal Section

A. R. A. Registration

THE official registration of members and guests of the signal section at the Drake Hotel yesterday totaled 350. It was noticeable that the majority of the members registered in the forenoon, but there was a steady increase in the totals throughout the day.

Representative Members

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Caley, G. H., elec. & sig. engr., N. Y., O. & W., Middletown, N. Y.
Caron, A., supr. sigs., Canadian National, Central Region, Richmond, Que., Can.
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Christofferson, C. A., sig. engr., N. P., St. Paul, Minn.
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Higgins, L. F., American Railway Association.
King, C. F., Jr., gen engr., Westinghouse Electric Co., East Pittsburgh, Pa.
Lester, J. G., sig. supr., B. & O., Cumberland, Md.
Moore, L. D., ry sals engr., French Battery Co., 1409 Conway Bldg., Chicago.
Moore, W. S., engr. m. w., L. H. & St. L. Louisville, Ky.
Moorman, J. S., asst trainmaster, L. H. & St. L., Louisville, Ky.
Schroeder, J. H., v. p., Sunbeam Electric Manufacturing Co., Evansville, Ind.
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Waldron, J. M., sig. engr., I. R. T., New York City.
Weart, E. T., salesman, John A. Roehlings, Sons Co., 165 W. Lake St., Chicago.

The Board of Directors of the N. R. A. A. in Session at the Offices of the Association Saturday Morning

N. R. A. A. Exhibit Opens at Coliseum

Products of 188 *exhibitors is largest display of engineering materials ever assembled*

THE eighteenth annual exhibition of the National Railway Appliances Association, which opened yesterday morning at 8 o'clock again establishes several new records. Exhibitors this year total 188, as compared with 176 last year, while the displays of railway materials and devices are more elaborate than ever before. The registration of supply men is 250 above last year and before the close of the exhibition over 30,000 visitors are expected. The efforts of C. W. Kelly, secretary of the National Railway Appliances Association, and his assistants, have resulted in an interesting, instructive and comfortable reception for visitors.

Every available inch of room in the Coliseum proper and the annex at the north and south ends of the building, containing more than 16,000 sq. ft., has been used to accommodate the exhibitors and even then 32 applications for space could not be filled. The new north hall is being used as the main entrance while the exit is located in the south hall. The center entrance leading from the north annex into the main hall of the Coliseum is wide enough to prevent any congestion in the passage of the visitors through the aisles.

Three tones of green are comprised in the decorations, emerald green being used for trimmings. Drapes made of the three tones of green are hung from the ceiling to the balcony. The railings of the balcony are also covered. The panels separating the exhibits are of a lighter green while the borders are made up of dark or emerald green. The electrical decorations are all new, a system having been installed which gives more light.

All entrances are protected by canopies extending over the sidewalk and are marked with appropriate signs of the exhibition. Telephones are available in the center of the Wabash side of the main building and a restaurant is located in the basement of the Coliseum where visitors may secure food without leaving the building.

Registration for members of the National Railway Appliances Association is as usual in the office of the secretary on the east side of the main building. In addition, registration desks for members of the American Railway Bridge and Building Association, the Roadmasters' and Maintenance of Way Association, the American Railroad Signal Supervisors' Association and the National Scalemen's Association are located in spaces 198 and 217.

More than 4,500 invitations have been sent to railroad officers, engineering societies, Interstate Commerce Commission employes and engineering colleges. In addition, 100,000 passes have been distributed among the exhibitors. The Coliseum will open each day from 8 a. m. until 6:30 p. m. except today, when the doors will remain open until 10:30 p. m. The final closing of the exhibition will be at 1 p. m. on Thursday.

The officers and members of the board of directors of the National Railway Appliances Association who served during the past year are, president, W. J. Gillingham, Union Switch & Signal Co., New York; vice-president, W. B. Murray, Miller Train Control Corporation, Danville, Ill.; secretary-treasurer, and director of exhibits, C. W. Kelly, Kelly-Derby Company, Inc., Chicago; honorary director, A. J. Filkins, Paul Dickinson, Inc., Chicago; directors, S. P. McGough, Lorain Steel Company, Chicago; A. L. Greenabaum, O. F. Jordan Company, East Chicago; Ind.; L. E. Weidman, Frog, Switch & Manufacturing Co., Carlisle, Pa.; J. W. Fogg, MacLean-Fogg Lock Nut Co., Inc., Chicago; F. M. Hartley, Jr., National Lead Company, New York; and M. C. Beymer, Oxweld Railroad Service Company, Chicago.

The following is a list of the firms which are presenting exhibits with the devices on display and the

names of the representatives who are present at their booths. The devices exhibited for the first time are shown in bold face type.

Adams & Westlake Company, Chicago.—Signal and engine, lamps; lanterns; highway crossing warning signals; **highway flashing signals; stop signs; car inspector's and car checker's electric lantern; motor car headlights; signal lamps equipped with mirrors.** Represented by A. S. Anderson, W. J. Piersen, H. G. Turney, F. W. Foehringer, W. G. Porter, J. McGregor Willits, E. Andrews, Russell John and J. N. Black. Space 77, 78, 96 and 97.

Adams Motor & Mfg. Co., Chicago.—Gasoline operated motors cars. Represented by W. E. Adams, R. S. Adams, W. A. Bailey and W. M. McClintock. Space 218 and 218½.

Air Reduction Sales Company, New York City. Oxygen; acetylene; oxyacetylene welding and cutting apparatus and supplies. Represented by E. M. Sexton, B. N. Law, W. H. Ludington, R. T. Peabody, C. A. Daley, G. M. Calmback and G. Van Alstyne. Space 167, 167½ and 168.

American Car & Foundry Co., Chicago.—Electric metal heaters. Represented by A. G. Wood. Spaces 242 and 261.

American Casting Company, Birmingham, Ala.—Culvert pipe; head walls. Represented by D. B. Dimick, H. V. Dimick, D. B. Dimick, Jr., and Thomas Bellsnyder. Spaces 243, 244, 259 and 260.

American Chain Company, Inc., Bridgeport, Conn.—One piece guard rail; car replacers; rail benders; rail clamps. Represented by A. H. Weston, W. C. Wolfe, George B. Kutz, W. P. Burleigh, Jr., J. N. Lee and A. P. Van Schaick. Space 81 to 83.

American Fork & Hoe Co., Cleveland, Ohio.—Rail anchor; stone ballast forks; fork and shovel handles; hoes; handle tops; **rolled tapered steel joint shims for worn joints.** Represented by A. F. Fifield, R. P. Wilkins, John Reagan, Tom Foley and Emmett Keough. Space 235.

American Hoist & Derrick Co., St. Paul, Minn.—Illuminated cut-out drawing of railroad ditcher; colored photo enlargement of standard locomotive ditcher; pile driver; continuous chain tread ditcher; electric welder; electric rivet heaters; photo enlargement of ballast shovels. Represented by W. B. Mauer, J. L. Hickey, C. T. Hook, G. G. Prest, W. K. Garvin, P. J. Kiwus and Miss H. Hoeller. Spaces 37 and 38.

American Malleable Castings Association, Cleveland, Ohio.—Castings; plates; drop hammer; torsion machine. Represented by Enrique Touceda, J. H. Lansing and J. B. Deisher. Spaces 181 and 183.

American Railway Hydrant & Valve Co., Stapleton, N. Y.—Water hydrants; stock yard cocks. Represented by W. Volkhardt. Space 159½.

W. J. Gillingham, Jr.
President

For many years Mr. Gillingham has participated actively and constructively in the affairs of this association. His advancement to the presidency, last March, was a fitting recognition of his service. He has been identified with the railway supply industry since joining the Hall Switch & Signal Company in 1901. Mr. Gillingham entered the service of the Pennsylvania as a machinist's apprentice in 1881. Later he was appointed assistant signal engineer of that road and two years later filled a corresponding position on the Chicago & North Western where he remained a short time, until being called to the Illinois Central as signal engineer. From 1901 until the recent consolidation of the Hall Switch & Signal Company he was vice-president of the former company.

American Steel & Wire Co., Chicago.—Right of way, park, paddock and snow fences; steel fence posts; corner posts; station ground fence; railroad fence gates; rail bonds; electrical wire and cables; signal wire; wire rope. Represented by C. S. Knight, H. A. Squibs, L. P. Shanahan, John May, C. F. Wiley, H. H. Sebrey, H. H. Bartel, J. W. Patterson, A. W. Froude, J. W. Collins and D. R. Waterman. Space 265 and 278.

American Valve & Meter Company, Cincinnati, Ohio.—Water column; drop spout; telescopic spout; switch stands; interlocking switch stands; switch interlockers; safety switch appliances; **switch interlock; tank level control.** Represented by J. T. McGarry, F. C. Anderson, J. W. McGarry, L. Norvell, J. DePinal, T. F. Pike, Cecil W. Stevens and W. L. Potter. Space 130 to 133.

Ames Shovel and Tool Co., Boston, Mass.—Track shovels and locomotive scoops. Represented by Edwin T. Nipher, Samuel D. Burrell, Walter H. Jenks. Space 186.

Anchor Company, Milwaukee, Wis.—Rail anchors; rail braces. Represented by George H. Chadwell, E. J. Correll, W. C. McMahon, Edmund Fitzgerald and Clarence Knapp. Space 163½ and 164.

Andrix Lock Nut Company, Adrian, Mich.—Lock nuts; **wrenches.** Represented by Harry Andrix, J. A. Reck, Burdette Andrix and Fred R. Fogle. Space 161½.

Arcco Anti-Rail Creeping Company, Inc., Owego, N. Y.—Anti-rail creeper. Represented by James R. Steele. Space 168½.

Armco Culvert & Flume Mfrs. Assn., Middletown, Ohio.—Corrugated iron railroad culvert; demonstration of jacking method of culvert placement; mechanical uses of ingot iron; snow fence; **perforated iron pipe.** Represented by A. S. Rosing, L. M. Sandston, A. W. Spaulding and J. R. Wilks. Space 99 and 100.

Asbestos Shingle, Slate & Sheathing Company, Ambler, Pa.—Asbestos shingles; asbestos corrugated roofing and siding; wall board; **asbestos lumber; moulded asbestos products.** Represented by J. H. Jacobsen and J. R. Adams. Space 169.

Automatic Grade Crossing Signal Company, Chicago.—**Grade crossing signal gate.** Represented by O. L. Vincent, Joseph M. Hora and M. D. Parker. Space 225.

Baker-Raulang Company, Cleveland, Ohio.—Locomotive type crane truck; electric elevating truck; lift truck; wheel tractor. Represented by T. W. Barnes, W. F. Hebard, F. N. Phelps and H. B. Greig. Space 205 and 210.

Balkwill Manganese Crossing Co., Cleveland, Ohio.—Heavy duty cast manganese crossing frog improved at flangeway intersections. Represented by S. Balkwill. Space 50½ and 51.

Barber Asphalt Company, Philadelphia, Pa.—Miniature railway grade crossing. Represented by Messrs. Dowdell, Fowle, Oliensis, McKay and Rector. Space 163.

Barrett Company, New York City.—Roll roofing; waterproofing material; prepared roofings; wood preservative; paints; roof coating. Represented by Frank P. Nichols, W. E. Rowley, F. M. Strawn, H. R. Hanson and W. F. Dorcot. Space 189.

Bethlehem Steel Company, Bethlehem, Pa.—Switch stands; hook flange guard rails; gage rods; **switch stand for derails.** Represented by Neil E. Salsich, H. E. Stoll, G. A. Richardson, R. P. Deghuee, C. L. Moses, J. W. Stoever, R. Knibloe, J. F. Hennessy, Frank Hoffman, M. A. Vickers, G. H. Riddle, J. V. Honeycutt, W. W. Philler, H. W. Prindle, C. A. Alden, E. B. Allen and R. S. Malone. Space 70½, 71, 71½ and 72.

Blaw-Knox Company, Pittsburgh, Pa. Clamshell buckets and models; two line and single line clamshell buckets and models; application of single line buckets to ash pit service shown by working models; traveling crane model; steel bins; measuring equipment for concrete aggregates. Represented by G. Schirmer and J. H. Flynn. Space 89.

Brach Mfg. Co., L. S., Newark, N. J.—Lighting arresters, signal accessories, semaphor lamps; ground detector; rail clamps; **switch lamps.** Represented by Godfrey Gort, F. T. Falth and G. S. Priebard. Space 234.

Brown Rail Loader Company, Boston, Mass.—Rail unloader. Represented by James C. Barr and William B. Joyce. Spaces 229 and 230.

Buda Company, Harvey, Ill.—Motor cars; car replacers; wheels; earth drill with power plant; bumping posts; crossing gates; jacks; headlights; track liners; switch stands; tool grinders; track gauges; levels; drilling machine; wheel puller; **ball bearing journal jack.** Represented by L. M. Viles, F. E. Place, H. M. Sloan, Wm. P. Hunt, Jr., R. B. Fisher, J. L. Artmaier, H. P. Bayley, H. C. Beebe, A. L. Bliss, R. F. Breitenfeld, H. S. Brown, C. H. Bull, H. M. Clawson, E. D. Conant, H. Thoresen, E. J. Conant, J. B. Conant, A. H. Deimel, J. J. Gard, G. W. Hoover, J. R. Mayeski, H. L. Miller, J. E. Murray, M. A. Ross, L. O. Stratton, F. R. Taggart, E. H. Walker, J. H. Weare, W. S. Weston, C. W. Wood, P. W. Wood, J. A. Walch, R. M. Blackburn and G. A. Secor. Space 45, 46, 47, 64, 65 and 66.

Burr Adjustable Mail-Crane Company, Chicago.—**Adjustable mail-crane; working models of pouch locking mail-catcher; and of a mail delivering mechanism.** Represented by F. H. Newton and Newton R. Burr. Space 172½.

Carbic Manufacturing Company, Duluth, Minn.—Acetylene flare lights; oxy acetylene welding and cutting apparatus; portable generators; generator. Represented by R. C. Duncan, C. H. Bolinder and V. A. Leaveau. Spaces 165, 166 and 166½.

Carey Philip Company, Cincinnati, Ohio.—Track pavement; track insulation. Represented by H. L. Rogers, H. V. Clarke, K. F. Davis and Arthur Worrall. Space 219.

Carnegie Steel Company, Pittsburgh, Pa.—Rails; splice bars; cross ties; track accessories; wheels; **light weight freight car wheels.** Represented by N. M. Hench, J. F. Miller, R. L. Twitchell and G. R. Schreinen. Space 268 to 275.

Carter Bloxonend Flooring Company, Kansas City, Mo.—Built-up wood block flooring. Represented by C. J. Carter, A. E. Giese and John Thomasma. Space 4.

Celotex Company, Chicago.—Insulating lumber for general building structures; material; **erected to wood studding, showing ease and convenience of application.** Represented by J. H. Bracken, G. R. McVay and J. H. Thomas. Space 6.

Challenge Company, Batavia, Ill.—Complete working model of tank and tank fixtures. Represented by Frank Snow, M. J. Marcuson, R. L. Lewis, H. E. Hansen, W. Dickinson and P. V. Elfstrom. Space 109.

Chicago Bridge & Iron Works, Chicago.—Conical-bottom steel tank; floating roof for oil tanks. Represented by George T. Horton, Merle J. Trees, H. B. Horton, H. T. Horton, C. S. Pillsbury, S. A. Poyer, Lewis McDonald, Ralph Green, E. E. Alt, C. M. Ladd, O. A. Bailey, E. E. Michaels, M. E. Smith and E. P. Shelton. Space 84 and 85.

Chicago Malleable Castings Company, West Pullman, Ill.—Rail anchor tie plate; rail braces; track fasteners; bumping post. Represented by J. S. Llewellyn, W. L. Beaudway, E. D. Sheriffs, C. A. Benz, J. H. Slawson and Warren Osborn. Space 142.

Chicago Pneumatic Tool Company, New York City.— Portable compressors; pneumatic and electric tools. Represented by A. E. Goodhue, J. L. Rowe, J. V. Conway, E. K. Lynch, H. R. Deubel, F. R. Liggett, E. Aplin and G. G. Porter. Space 118, 119, 137 and 138.

Chicago Railway Signal & Supply Company, Chicago.—Light signals; relays; **five watt light; color position light and dwarf signals; polar relay; switch circuit controller.** Represented by C. M. Poor, D. J. McCarthy, A. C. Dunne, Carl Suhr, George Rekers, C. H. Rath and A. H. Anderson. Space 108½.

Chipman Chemical Engineering Co., Inc., Bound Brook, N. J.—Chemical weed killer. Represented by R. N. Chipman and T. B. Bowman. Space 89½.

Clark Car Company, Pittsburgh, Pa.—Action photographs and blueprints of extension side dump cars. Represented by T. B. Counselman, W. R. Kennedy, J. J. McGarrigle and H. E. Chilcoat. Space 115.

Cleveland Frog & Crossing Company, Cleveland, Ohio.—Represented by George Stanton, G. A. Peabody and J. A. Donahey. Space 90.

Cleveland Pneumatic Tool Co., Cleveland, Ohio.—Air drills, riveting, chipping, calking, beading and peining hammers; reaming, tapping, flue rolling and wood boring machines; stay bolt setting motors; valve setting and cylinder boring machines; manifolds; air valves; hose couplings; hose clamps; sand rammers; **air motors; air grinders; rock drills; clay diggers; tampers; paving and rock breakers; multiple supply manifolds.** Represented by H. S. Covey, C. J. Albert, B. H. Tripp and H. C. Newton. Space 144.

Cleveland Railway Supply Company, Cleveland, Ohio. Flangeway guards; switch stands; rail anchors; foot guards; guard rails. Represented by F. A. Peck, W. H. Nesson, H. P. Blum, and Q. Winsor. Space 289 and 290.

Cleveland Railway Supply Company, Cleveland, Ohio.—Switch stand; safety foot guards; **rail anchors;** one-piece manganese guard rail. Represented by H. P. Blum, F. W. Cherry, W. H. Neeson and F. A. Peck. Spaces 289 and 290.

Cook, Inc., A. D., Lawrenceburg, Ind.—Deep well pumps; strainers; cylinders; sucker rods; foot valves; tubular well supplies; **two-stroke self-oiling deep well pumps.** Represented by Cornelius O'Brien, James F. Freeman and Charles F. Harris. Space 136.

Copperweld Steel Company, Rankin, Pa.—Signal wire; telephone wire; telegraph wire; overhead ground wire; guy wire; messenger wire; cable rings; ground rods; nails; staples; twisted pair; **fence; barbed wire; ground wire clamps for copperweld ground rods.** Represented by W. Marshall Page, W. S. Krenz, A. M. Kremkau, E. G. Elg and W. W. Martin. Space 13.

Creepcheck Company, Inc., Hoboken, N. J.—Rail anchors; **snow melting device.** Represented by R. R. B. Dinklage, F. J. Reagan, T. D. Crowley and N. J. Leavitt. Space 214.

Crerar, Adams & Company, Chicago.—Power and hand drill for bonding; track drills; track tools; heat treated track shovels. Represented by Russell Wallace; J. A. Martin, C. J. Grentz, E. C. Poehler, C. W. Gregory and G. D. Bassett. Space 28.

Cullen-Friestedt Company, Chicago.—Steel crane. Represented by T. D. Crowley, W. C. Bamber, F. J. Reagan, Stephen Smith, E. V. Cullen, F. J. Cullen, F. P. Cullen, K. J. Beller, E. J. Shaughnessy and A. O. Walker. Space 199 and 216.

Dearborn Chemical Company, Chicago.—Scientific feed water treatment; preventive. Representd by C. M. Hoffman, E. M. Converse, D. K. French, J. W. Harkins, N. F. Dunn, L. P. Bowen, O. H. Rehmeyer, Fred B. Horstmann, W. D. Bennett and C. I. Loudenback. Space 251.

Detroit Graphite Company, Detroit, Mich.—Paint. Represented by T. R. Wyles, P. L. Maury, L. D. Mitchell, W. D. Waugh, J. R. C. Hintz, R. H. Ming, L. F. Flanagan, A. B. Edge, Walter H. West and J. F. Neiman. Space 58 and 59.

Dickey Clay Mfg. Co., W. S., Kansas City, Mo.—**Working model of railroad track and right of way showing drainage and elimination of water pockets; clay products.** Represented by J. A. Millsom, John D. Cook, John W. Hunter, F. T. McKown, O. J. Neece, N. A. Farrar and W. C. Snyder. Space 116.

Dickinson, Inc., Paul, Chicago.—Smoke jacks for engine houses and small buildings; roof ventilators for all buildings; model of locomotive drafter. Represented by A. J. Filkins, C. Wm. Hansen and A. E. Engman. Space 88½.

Dilworth, Porter & Co., Inc., Pittsburgh, Pa. Tie plates; spikes. Represented by W. F. Schleiter and Joseph Dilworth. Space 27.

Duff Manufacturing Company, Pittsburgh, Pa.—Jacks; lifting jacks; double and single acting track jacks. Represented by C. N. Thulin, E. E. Thulin, T. A. McGinley, E. A. Johnson, Geo. E. Watts, G. E. Anderson, P. G. O'Hara, W. G. Robb, E. M. Webb and Frank Schwerin. Space 35 and 36.

Edison, Inc., Thomas A., Bloomfield, N. J.—A. C. and primary battery system; relay; edaligners; flashers; primary batteries; electric lighting equipment for semaphores and switch lamps. Represented by L. W. McChesney, R. E. Trout, L. S. Dunham, E. W. Brown, F. S. Stallknecht, C. R. Heron, P. A. Garrity, R. J. Frost, O. P. Rose, B. F. Hines and E. W. Newcomb. Space 18 and 19.

Edison Storage Battery Company, Orange, N. J.—Portable signal batteries; "nite" box; train control and car lighting batteries; trickle charge cells; sections of batteries. Represented by W. F. Bauer, D. C. Wilson, A. M. Anderson, L. C. Hensel, R. C. Haley, A. S. Knox, D. B. Mugan, U. C. McMillan and G. F. Wakeman. Space 20.

Electric Storage Battery Company, Philadelphia, Pa.—Batteries for railway signaling; **covers on battery cells.** Represented by H. B. Crantford. Space 40.

Electric Tamper & Equipment Company, Chicago.—Electric tie tamper; portable lighting plant; **portable lighting fixtures.** Represented by C. Jackson, H. W. Cutshall, V. G. Cartier, R. O. Shaffer, J. C. Jameson, R. Cartier and C. E. Stamp. Space 204 and 211.

Elwll-Parker Electric Company, Chicago.—Electric crane truck; tractor; lift truck; **tiering truck; new type lift truck.** Represented by Geo. W. Brown, H. F. Ostrander and A. H. Dobler. Space 200 and 215.

Engineering News-Record, New York City.—Publication. Represented by W. T. Chevalier, V. T. Voughton, F. C. Hugson, C. J. Laughlin and E. E. R. Cratman. Space 155.

Euclid Electric & Mfg. Co., Euclid, Ohio.—**Gas, electric power car; electrically driven tools for maintenance work.** Represented by C. Rasmussen, D. A. Collings, E. J. Correll, C. E. Stamp and J. L. Evans. Space 203.

Fairbanks, Morse & Co., Chicago.—Motor cars; standpipe; scale; electric motors; centrifugal pumps; **centrifugal pump direct connected to a 15 H. P. 3,600 r.p.m. type H electric motor operating.** Represented by P. H. Gilleland, E. E. Pendray, G. Howard, L. H. Matthews, J. E. Woods, E. J. Coverdale, E. P. Chase, F. J. Lee, E. C. Golladay, C. B. O'Neil, F. C. Snyder, E. M. Fisher, L. R. Boyer, S. G. Eaton, C. G. Mahana, F. P. Drinker, J. C. Flanagan, H. M. Beebe, F. M. Condit, H. L. Hilleary, C. T. Fugitt, W. L. Nies, J. L. Jones, H. E. Vogel, R. F. Lane, B. S. Spaulding, D. K. Lee, C. H. Wilson, A. J. Olson, C. A. Rauch, G. W. Lewis, F. V. Roy, Wm. Dehn, J. T. Frame, W. F. Anderson and C. W. Laing. Space 73 to 76 and 92 to 95.

Fairmont Railway Motors, Inc., Fairmont, Minn.—Railway motor cars and engines. Represented by H. E. Wade, W. F. Kasper, H. M. Starrett, W. D. Brooks, E. R. Mason, S. D. Gibson, L. R. Payton, W. G. Day and C. W. Brhel. Space 41 to 44.

Fleming & Son Co., J. R., Scranton, Pa.—Switch point protector. Represented by A. J. Fleming and J. A. Moffit. Space 283.

Frog, Switch & Manufacturing Company, Carlisle, Pa.—Hard center stiff frog; spring rail frog; **manganese steel switch point protector.** Represented by L. E. Weidman and A. Gordon Jones. Space 51½ and 52.

Central Electric Company, Chicago.—Lighting units; electrical devices; portable cords. Represented by W. H. East, J. M. Lorenz, G. C. Jerome, E. P. McCann, E. L. Pollock, Jr., and W. E. Buckmaster, Jr. Space 2.

General Electric Company, Schenectady, N. Y.—Automatic sub-station; electric arc welding; lightning arresters; signal equipment. Represented by C. C. Bailey, F. P. Jones, H. M. Jacobs, John Roberts, L. W. Shugg, C. T. McLaughlin. Spaces 270 to 273.

General Railway Signal Company, Rochester, N. Y.—Signals; switch machine; table interlocker; interlocking equipment; relays; transformers; track reactor; clockwork time release; time contactor; terminals; arresters; fuses; track resistances; lightning arrester; **electric car retarder system.** Represented by P. E. Carter, W. D. Cloud, R. Connell, S. M. Day, F. L. Dodgson, J. A. Geneser, W. S. Henry, C. Henze, A. C. Holden, W. K. Howe, E. C. Larry, H. W. Lucia, F. W. Moffett, A. G. Moore, F. W. Nixon, C. W. Prescott, W. H. Reichard, P. Renshaw, J. F. Stephenson, L. Thomas, H. C. Ware, S. N. Wight, F. W. Rizer and A. C. Smith. Space 48 to 50.

Graver Corporation, East Chicago, Ind.—Water softeners; steel tanks. Represented by J. J. Felsecker, J. C. Winslow and Wm. Gross. Space 280.

Graybar Electric Company, Chicago.—Represented by Geo. Hull Porter, E. J. O'Donnell, H. C. Gump, W. P. Hoagland, J. Gleason, E. W. Kearns, J. J. O'Connor, W. Weiss and A. G. Nabors. Space 252.

Hackman Railway Supply Company, Chicago.—Track liners; rail clamps; jacks; jack plates; **two step track liner.** Represented by Ben Cheney, Porter Laughlin, Frederick Hackman and J. J. Franzen. Space 224.

Handlan Buck Mfg. Company, St. Louis, Mo.—Color light signal; signal lamps; Loco fixtures; **dwarf signals; lanterns; flashing light crossing signals.** Represented by A. H. Handlan, Sr., E. R. Handlan, A. H. Handlan, Jr., T. J. Crowley, L. C. Kuehner, J. N. Gallagher and R. D. Evans. Space 264 and 279.

Hayes Track Appliance Company, Richmond, Ind.—Sliding, hinged and portable derails; bumping post. Represented by Edgar W. Brown, R. H. Gausepohl, S. W. Hayes, H. H. Jenkins, Herbert J. Mayer, E. L. McCarty, C. M. Moffitt, Sterling P. Reid, E. L. Ruby and F. C. Stowell. Space 140 and 141.

Hazard Manufacturing Company, Chicago.—Insulated wires and cables. Represented by C. P. Brodhun, T. A. Keefe, J. E. Ham and L. W. Allen. Space 21 and 22.

Headley Good Roads Company, Chicago. Asphalt highway crossings and station platforms. Represented by W. T. Gilbert, W. F. Moore and F. X. Fern. Space 157½, 158 and 159.

Henion & Hubbell, Inc., Chicago.—Power pumps. Represented by Frank P. Perkins. Space 223.

Binks Spray Equipment Company, Chicago. **Two gun paint spray mounted on portable motor car; small portable compressing unit on hand truck; 12 gal. pressure tank container; paint spray accessories.** Represented by H. D. Binks, Gerald Hale, F. Van DeBogert, M. J. Binks, G. N. Gerew, O. D. Soellner, A. Christinson. Space 228.

Howlett Construction Company, Moline, Ill.—Self loading bucket and loader. Represented by W. E. Howlett, G. B. Holmes and W. E. Hobbs. Space 284.

Hubbard & Co., Pittsburgh, Pa.—Track tools; nut locks; track shovels; locomotive scoops; pole line material. Represented by J. W. Hubbard, Marchall Lasher, J. S. Wincrantz, F. E. Norman and T. F. Wilder. Spaces 103 and 104.

Hussey Mfg. Co., North Berwick, Me.—**Tie lifter.** Represented by P. W. Hussey. Space 192½.

Illinois Steel Company, Chicago.—Track spikes; screw spikes; bolts; nuts; tie plates; rail joints; angle bars; wrought steel wheels for passenger and freight car service; **single life wheel for freight car service.** Represented by C. R. Moffatt, P. W. O'Brien, D. T. Buffington, R. Korsan, C. B. Friday, O. H. Baker, L. G. Hagen, A. P. Selby, E. G. Sutcliffe, G. A. Price, J. A. McCree, B. T. Wherry, R. G. Glass, Grant Monk, B. Eyman and D. F. Glos. Space 268, 269, 274 and 275.

Ingersoll-Rand Company, New York City.—Electric and gasoline driven portable power compressors; tie tampers; tie tamper tools; air operated tools; oil electric locomotive. Represented by W. H. Armstrong, E. F. Kultchar, C. W. Melcher, J. P. Gillies, F. D. McDermott, T. H. Weigand, Fred Ursem and Fred Cross. Space 206 to 209.

Inland Glass Company, Chicago.—Signal lenses; lantern globes; illuminating glassware for offices and grain sheds. Represented by C. B. Mitchell and J. H. Allen. Space 236.

International Signal Company, New York City.—**Automatic train control: mechanical speed control.** Represented by Jean F. Webb, Jr. and H. Tracy Rogers. Space 114.

Johns-Manville, Inc., New York City.—Asbestos smoke jacks, roofing, shingles, lumber; pipe and boiler insulation; piston packings. Represented by P. R. Austin, W. R. Bush, C. S. Clingman, E. L. Colopy, H. J. Crowe, H. Flannagan, P. C. Jacobs, J. D. Johnson, W. H. Lawrence, G. A. Nicol, T. O'Leary, L. Papineau, C. M. Patten. Space 174 to 177.

Jordan Company, O. F., East Chicago, Ind.—Spreader; ditcher. Represented by A. W. Banton, J. C. Forbes, A. L. Greenabaum, Walter J. Riley and J. S. Zuckerman. Space 60 to 62.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Motor cars; electric crossing gate; track drills; gages; levels; pressed and rolled steel wheels; wood center wheels. Represented by F. E. McAllister, P. Robischung, G. E. Bridge, H. Kelsey, L. W. Bates, L. W. Boswell, R. E. Keller and Albert C. Heath, Jr. Space 8, 8½, 23, 24 and 25.

Kelly-Derby Company, Inc., Chicago.—Chemical toilets; septic tanks; wash fountain with foot control. Represented by Harry Gibson, C. N. Leet, James Wilcox, K. H. Chapman, E. I. Kelly and Richard Emmet. Space 29.

Kentucky Rock Asphalt Co., Inc., Louisville, Ky. Surfacing for grade crossings, depot platforms, shop floors, etc. Represented by W. F. Pollard. Space 156 and 157.

Kerite Insulated Wire and Cable Co., Inc., New York City.—Insulated wire and cable. Represented by R. D. Brixey, B. W. Parsons, B. L. Winchell, Jr., W. H. Fenley, Azel Ames, J. Warren Young, E. M. Branchfield, J. A. Renton, J. A. Hamilton, E. L. Adams, C. A. Reeb, C. E. Hieber and C. M. Deardorff. Space 88 and 107.

Keystone Grinder & Mfg. Co., Pittsburgh, Pa.—Tool grinders; **motor power twist drill attachments for redressing milling cutters, gear cutters, valves.** Represented by S. S. Newman and L. J. Cooney. Space 193.

Keystone Steel & Wire Co., Peoria, Ill.—Woven wire; barbed wire; **R. R. gates.** Represented by J. P. Distler, H. C. Woodside and A. A. Nelson. Space 257.

Klauer Manufacturing Co., Dubuque, Ia.—Charcoal re-

S. P. McGough, Director

A. L. Greenabaum, Director

L. E. Weidman, Director

W. B. Murray, Vice-President

A. J. Filkins, Honorary Director

C. W. Kelly, Secretary-Treasurer

J. W. Fogg, Director

F. M. Hartley, Jr., Director

M. C. Beymer, Director

Officers of the National Railway Appliances Association

frigerator car heaters; cutout foot switches; corrugated culverts; portable electric welders; culvert and headwall construction for small bridges. Represented by R. I. Schuppener and A. J. Jaeger. Space 202.

Layne & Bowler Mfg. Co., Memphis, Tenn.—Pump head for vertical centrifugal pump; pump bowls; shutter screen for deep wells; bronze wire screen for deep wells; **working model of old type deep well; gravel wall well with model vertical centrifugal pump operating each well.** Represented by T. H. Buckley. Space 219½.

Lehon Company, Chicago.—Asphalt shingles and roll roofing; waterproofed fabrics; felts; membranes and insulating papers; asphalt car specialties; asphalt roof coatings and cements; waterproofing compounds. Represented by Tom Lehon, J. W. Shoop, J. E. Eipper, H. A. Wolfe, F. A. Locke. Space 91.

Locomotive Finished Material Company, Atchison, Kan.—Steel highway crossing. Represented by R. L. McIntosh and Clive Hastings. Space 143.

Lorain Steel Company, Johnstown, Pa.—Manganese railroad crossing; manganese one piece guard rail; forged guard rail clamps; manganese self-guarded frogs; hard center frogs; spring frogs; switch stands; expansion joint; gauge rod insulated; straight rail; curved rail; cast steel car stop. Represented by Carroll Burton, E. B. Entwisle, H. C. Stiff, C. R. Bossler, J. A. McHugh, Wm. Lynam, S. J. Cotsworth, W. W. Kingston, D. P. Steward, A. L. George, S. P. McGoug, H. H. McDonald, W. H. Andrews and Otto Fischer. Space 266, 267, 276 and 277.

Louisville Frog & Switch Company, Louisville, Ky.—Bumping post; switch points; solid manganese frog; **crossing safety flag.** Represented by F. W. Carter, J. S. Drillette, C. A. Boyd, E. A. Mann and Cecil W. Stevens. Space 263.

Lufkin Rule Company, Saginaw, Mich.—Tapes; rules; tools. Represented by Theo. P. Young, A. V. Huss and S. A. McConnell. Space 121.

Lundie Engineering Corporation, New York City.—Tie plate; rail anchor. Represented by L. B. Armstrong, John Lundie, Eugene Brandeis, George Nibbe and W. Brooke Moore. Space 90½.

Lundy Company, E. A., Pittsburgh, Pa.—Rectifiers; transformers; track instrument; flashing light signals; high tension line materials; **connectors; lighting relays; time element relays; bond.** Represented by E. A. Lundy, Preston Parish, C. G. McCaulley, P. M. Etters and J. S. Miller. Space 238 to 241.

MacLean-Fogg Lock Nut Company, 2649 No. Kildare Ave., Chicago.—**Lock nuts.** Represented by J. A. MacLean, J. W. Fogg, F. J. O'Leary, Clif Beaumont, George MacLean and T. W. Callahan. Space 1.

MacRae's Blue Book Company, Chicago.—Copies of MacRae's Blue Book. Represented by Albert MacRae, Lloyd Simonson, H. Deeming, Clyde Hill, G. R. Wilson, F. O. Rice, G. M. Scorgie, Alex Smith, Duncan Ferguson, C. S. Wallace, W. P. Dent, R. S. Jaquith, Arthur Fox, Don Ilette and E. E. Jones. Space 286.

Magnetic Signal Company, Los Angeles, Calif.—Railway crossing wigwag signals; relays; auxiliary "out of order" indicator signal; rail expander. Represented by H. W. Renick, J. V. Wescott and L. Boswell. Space 3.

Maintenance Equipment Company, Chicago.—Friction car stop; derail; rail laying machine; steel fence posts; tie spacer; switch point straightener; ballast screen; **motion pictures of skeletonizing machine; ballaster.** Represented by H. C. Holloway, J. A. Roche, E. Overmier and A. L. Arnold. Space 194 and 195.

Massey Concrete Products Corporation, Chicago.—Reinforced concrete cribbing; pipe; signal foundations; battery boxes. Represented by G. H. Redding, H. W. Wilder, E. C. Alexander, W. H. Robertson, Paul Kircher, D. A. Hultgren, E. M. Hathaway, W. L. McDaniel, C. H. Hunsaker, Charles Gilman, J. A. Higgs, Jr., F. V. Shannon and Norman E. Cloud. Space 54 and 55.

Mechanical Mfg. Co., Chicago.—Freight and passenger bumping posts; **improved cushioned bumping post.** Represented by H. E. Johnson and J. S. Banks. Space 245 and 258.

Metal and Thermit Corporation, New York City.—Rail welding equipment and material; samples of welded rails, crossings and locomotive frames; **rail clamps for lining joints preparatory to welding.** Represented by W. R. Hulbert, J. B. Tinnon, C. D. Young and L. G. Vock. Space 262 and 281.

Milburn Company, Alexander, Baltimore, Md.—Welding and cutting torches; gas regulators; carbide lights; **oil burner and preheater; acetylene generator.** Represented by C. R. Pollard and F. G. Squire. Space 161, 162 and 162½.

Miller Train Control Corp., Danville, Ill.—Locomotive and track control equipment; **induction type train control.** Represented by H. B. Miller, W. B. Murray, P. X. Rice, Earle Murray, P. E. Herren, E. B. Campbell. Space 249 and 254.

Morden Frog & Crossing Works, Chicago.—Manganese crossings; manganese frogs; switch stands; adjustable braces; guard rail clamps; switch adjustments; slide plates; **manganese crossing with special reinforced lattice corners.** Represented by W. H. Harts, J. F. Karcher, Geo. F. Killmer, B. T. Gibbs, W. J. Gilbert, S. Withrow and H. Macke. Space 69½ and 70.

Moss Tie Co., T. J., St. Louis, Mo.—Sections of cross ties treated and untreated. Represented by E. E. Pershall, J. S. Penney, R. M. Hamilton and Geo. C. Hannaway. Space 237.

Mudge & Company, Chicago.—Motor cars; push cars; trailers; pressed steel wheels; axles; bearings; trailer drawbars. Represented by Robert D. Sinclair, Albert C. Force, J. G. Abplanalp, C. P. Benning, F. H. DeBrun, V. Pagett, L. B. Ryan, F. C. Whitehouse, Arthur R. Fletcher, James C. Barr, Ralph W. Payne and A. P. Grenier. Space 127, 128, 146 and 147.

Murdock Mfg. & Supply Company, Cincinnati, Ohio.—Water service boxes; drinking fountains; hydrants. Represented by J. C. Endebrock. Space 134.

National Boiler Washing Co. of Illinois, Chicago.—Hot water blow-off washout and filling up systems for locomotive boilers; leadized pipe. Represented by Frederick A. Gale, T. G. Dalton, F. W. Gale, Wm. J. Wignall, F. S. Wichman, Prof. A. H. Carpenter and Wilson Herren. Space 12.

National Carbon Co., Inc., Cleveland, Ohio.—Dry cells; high voltage and standard voltage; primary cells; carbon brushes and products; storage cells. Represented by A. E. Pratt, D. H. Green, I. T. Kelly, P. G. Pendorf, L. M. Ritchie, M. D. Rees, R. J. Cox, J. S. Gemmel and L. R. Griffin. Space 151 to 153.

National Lock Washer Company, Newark, N. J.—Spring washers. Represented by J. Howard Horn, F. B. Archibald, R. L. Cairncross, W. H. Reaves, S. H. Smith and W. R. Hillary. Space 117.

National Malleable and Steel Castings Company, Cleveland, Ohio.—Track devices. Represented by T. W. Aishton, G. A. Faitz, C. H. Krakau, F. E. Moffett, E. A. Powell, G. R. Rasmussen and L. S. Wright. Space 102.

National Lead Company, New York.—Steel bridge model; paints. Represented by A. H. Salim, W. E. Carlisle, F. M. Hartley, Jr., C. E. Hass, F. E. Dodge and D. Louis Ireton. Spaces 187 and 188.

National Safety Appliance Company, Chicago.—Train control apparatus. Represented by K. E. Kellenberger, Ed C. Wilson, E. W. Stone and J. C. Anderson. Space 149 and 150.

National Vulcanized Fibre Company, Wilmington, Del.—Fibre for rail joints; steel cross ties; bridge insulation; shapes for mechanical and electrical use; **laminated bakelite.** Represented by John Barron. Space 126.

Nelson Manufacturing Company, B. F., Minneapolis, Minn.—Asphalt roofing; shingles; insulating paper; tarred felt; asphalt felt; waterproof paper. Represented by E. H. Batchelder, Jr., Henry Hay, H. H. Moffatt and K. T. Batchelder. Space 172.

Nichols & Bro., Geo. P., Chicago.—Electric turntable tractor; model of transfer table; two-wheel tractor. Represented by S. F. Nichols, Nicholas Fries and H. E. Notley. Space 173.

North American Cement Corporation, Hagerstown, Md.—A white powder admixture for concrete. Represented by Richard H. Catlett, John L. Hurley and Morrison M. Clark. Space 285.

Northwestern Mfg. Co., Milwaukee, Wis.—**Direct current arc welding generator.** Represented by Chas. F. Harris. Space 165½.

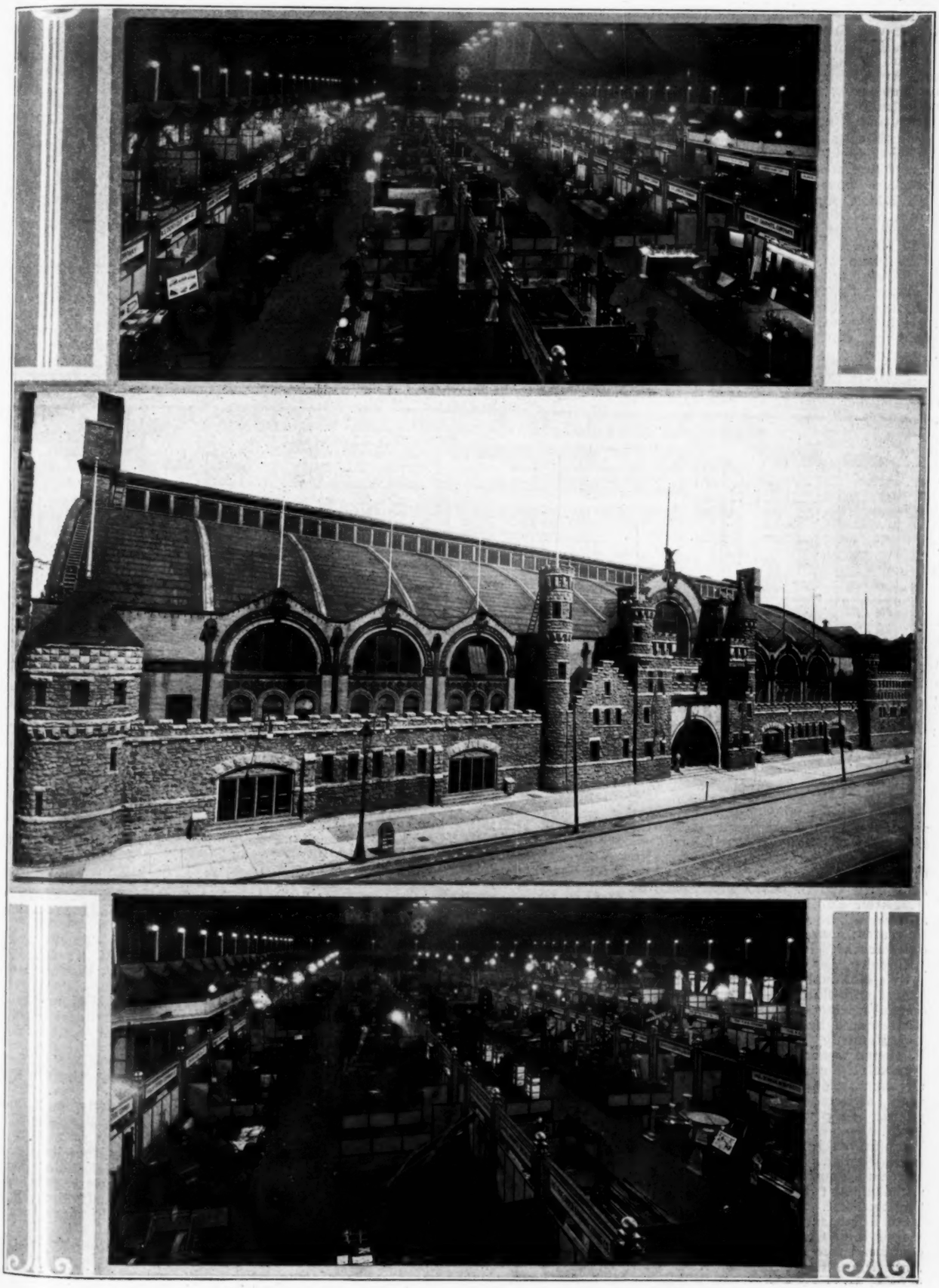
North Western Motor Company, Eau Claire, Wis.—Motor cars; equipment; six horse power engine; section motor car. Represented by W. N. Jeffreis, A. H. Nelson, F. W. Anderson, R. R. Rosholt, R. E. Hotchkiss, W. B. Jeffress, Walter Allen, Carl Hoppe, W. J. Roehl, A. A. Culp. Space 196, 196½, 197 and 197½.

Ogle Construction Company, Chicago.—Automatic hoist. Represented by C. F. Bledsoe, M. W. Powell and J. G. Forester. Space 31.

Ohio Brass Company, Mansfield, Ohio.—Insulators; rail bonds; **catenary overhead materials; car couplers for electrification.** Represented by W. P. Bovard, M. R. Gowing, O. M. Hullinger, F. E. Johnson, M. W. Manz, F. F. Seeburger and J. M. Strickler. Space 248 and 255.

Okonite-Callender Cable Co., Inc., Passaic, N. J.—**Impregnated paper cables; super-tension cables; splicing materials.** Represented by Chas. E. Brown, A. L. McNeill, C. E. Brown, Jr., R. N. Baker, E. H. McNeill, J. J. O'Brien, L. R. Mann, J. D. Underhill, F. J. White, J. W. Hackett, H. A. Hamilton and W. R. Van Steenburgh. Space 17.

Okonite Company, Passaic, N. J.—Rubber and varnished cambric cables; friction and rubber tapes. Represented by Chas. E. Brown, A. L. McNeill, C. E. Brown, Jr., R. N.



The Coliseum and Two Views of the N. R. A. A. Exhibit

Baker, E. H. McNeill, J. J. O'Brien, L. R. Mann, J. D. Underhill, F. J. White, J. W. Hackett, H. A. Hamilton and W. R. Van Steenburgh. Space 16.

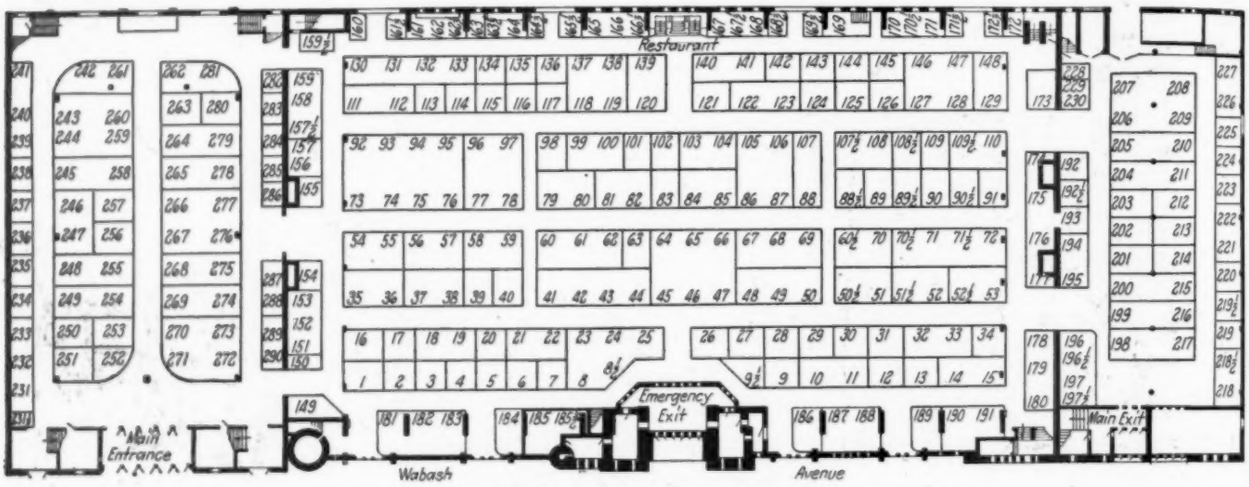
Oxweld Railroad Service Company, Chicago.—Represented by F. C. Hasse, M. C. Beymer, Wm. Leighton, E. S. Richardson, W. A. Hogan, H. W. Schulze, J. G. Tawse, Wm. Jones, L. C. Ryan, W. H. Kofmehl, C. A. Bloom, W. E. Campbell, F. J. Duffie, J. J. Graham, A. S. Jones, F. H. Lurquin, F. J. Lynch and J. E. Winslow. Space 10 and 11.

Page Steel and Wire Company, Bridgeport, Conn.—Welding wire; bonds; strand wire; right-of-way fence; wire link fence. Represented by W. T. Kyle, E. J. Flood and K. B. Bleecker. Space 83.

P. & M. Company, Chicago.—Rail anti-creepers; bond wire protectors. Represented by T. J. Byrne, S. M. Clancey, E. A. Coppock, J. M. Fairbairn, J. J. Gallagher, P. H. Hamilton, R. D. Hawley, D. T. Hallberg, G. E. Johnson, J. E. Mahoney, G. E. Olson, M. K. Ruppert, W. A. Maxwell, W. H. Reaves, L. S. Walker, C. A. Whritenour, H. C. Warr and G. E. Webster. Space 122 and 123.

Patterson Co., W. W., Pittsburgh, Pa.—Tackle blocks; steel blocks for wire cable; wood blocks for manila rope; steamboat ratchets. Represented by W. W. Patterson, Jr. Space 145.

Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.—Railroad service tank; photographs of installations. Represented by Ivan Bickelhaupt, Herbert Miller, A. C. Pearsall, Max Whitacre and W. W. Hendrix. Space 98.



The Floor Plan of the Coliseum

Pocket List of Railroad Officials, New York City.—Copies of publication. Represented by J. Alexander Brown, Harold A. Brown and B. J. Wilson. Space 26.

Positive Rail Anchor Company, Marion, Ind.—Weston rail anchor; girder guard rail chairs; rail braces; malleable iron tie plates; guard rail plates; braces; malleable iron castings; **dolly trucks.** Represented by A. H. Told, L. C. Ferguson, J. Shoulty, A. C. Moore and E. E. Griest. Space 178 to 180.

Pyle-National Company, Chicago.—Model floodlight tower basket with floodlights; train control turbo-generators; train control wiring devices; floodlight equipment wiring devices. Represented by Wm. Miller, J. Will Johnson, L. H. Vilas, J. J. Kennedy, T. P. McGinnis, Walter H. Haas and George E. Haas. Space 190 and 191.

Q. & C. Company, New York City.—Joints; derails; guard rail clamps; one piece guard rails; switch and target stands; snow melters; fence posts; **insulated joint; switch point guard; one piece guard rail, arch design.** Represented by F. F. Kister, Edgar M. Smith, James L. Terry, Lewis Thomas, R. J. McComb, H. T. Henry, L. T. Burwell and E. R. Packer. Space 120 and 139.

Racine Tool and Machine Company, Racine, Wis. High speed metal cutting machines; high speed portable rail cutting machine. Represented by M. E. Erskine, J. M. Jones, Wm. Reinhardt and George Reinhardt. Space 212.

Rail Joint Company, New York City.—Rail joints; **100 per cent head free reinforced track liner.** Represented by V. C. Armstrong, B. G. Braine, J. C. Barr, A. Chapman, E. A. Condit, Jr., C. A. Disbrow, W. E. Gadd, J. A. Greer, C. B. Griffin, H. C. Hickey, C. Jenkinson, G. H. Larson; J. H. Larmonth, M. Markley, J. G. Miller, J. N. Meade, E. Muehleck, R. W. Payne, T. Ryan, E. F. Schermerhorn, R. R. Seward, McLeod Thomson, W. P. Thomson, B. Wolhaupter and D. P. Wolhaupter. Space 79 and 80.

Railroad Accessories Corporation, New York City.—Bonding drill; steel blades; lightning arresters; resistance units; parkway bootlegs; **bond; bracket lamp; number plates; crossing signs; clamps; relay tension springs.** Represented by F. C. Lavarack, E. M. Deems, B. A. Lundy and W. G. Burns. Space 14 and 15.

Railroad Supply Company, Chicago.—Highway crossing protection devices; relays rectifiers; lighting units; signal accessories; tie plates. Represented by E. H. Bell, H. M. Buck, P. W. Kohnen, A. H. Smith, W. S. Boyce, Geo. T. Willard, Arthur H. Smith, M. J. Fox, F. M. Hill, T. H. Cole, John Hensel, Samuel Miskelly, A. J. Kohn, A. C. Reid, R. E. Bell and R. D. Hawley. Space 86, 87, 105 and 106.

Railway Purchases and Stores, Chicago.—Copies of publication. Represented by Edward Wray, K. F. Sheeran, H. B. Kirkland and J. P. Murphy, Jr. Space 231½.

Railway Review, Chicago.—Copies of publication. Represented by J. E. Gougeon, J. A. Walsh, A. D. McIntyre, R. H. Morris, C. H. Gertner, George E. Boyd and Charles Layng. Space 154.

Ramapo Ajax Corporation, Hilburn, N. Y.—Automatic safety switch stands; manganese one-piece guard rails; adjustable switch clips; manganese reinforced switch point; double shoulder solid bottom switch plates; forged rail braces; adjustable rail braces; heavy duty heat treated guard rail clamps; manganese tubular crossing; non-derailer; flange switch point protector. Represented by T. E. Akers, W. Bender, G. A. Carlson, J. V. Cowling, S. Dolan, C. G. Elliot, Dickson Fairback, W. J. Fairback, A. F. Hess, P. Hoffman, Darcy F. Hilton, J. V. Houston, W. C. Kidd, R. W. Payne, W. A. Peddle, H. W. Renick and J. B. Strong. Space 109½ and 110.

• Rawls Manufacturing Works, Chicago.—Track mower. Represented by S. E. Rawls, J. Kranz, B. M. Cheney, P. L. Laughlin, J. B. Snyder, E. R. Paulson and W. W. Fitzpatrick. Space 226 and 227.

Reade Mfg. Company, Jersey City, N. J.—Miniature equipment for distribution of weed exterminator. Represented by Chas. H. Reade, Ralph W. Pritchard and E. E. Prarie. Space 256.

Reliance Mfg. Company, Massillon, Ohio.—Nut locks. Represented by H. J. McGinn, R. Shireman, A. C. Rule, E. D. Cowlin, W. H. Crawford. Space 135.

Rice Manufacturing Company, Indianapolis, Ind.—Rivet cutter; **spike driver.** Represented by A. G. Rice and A. B. Clausen. Space 169½.

Richards-Wilcox Mfg. Co., Aurora, Ill.—Roundhouse and shop door hardware; milltype doors; parallel sliding doors; ball-bearing I-beam trolleys; **pier-work warehouse door hangers and track.** Represented by A. J. LaFleur, J. H. Wise, E. J. G. Phillips, A. W. Thurow, C. Riemenschneider, A. Tax and W. Guay. Space 170, 170½ and 171.

Roberts and Schaefer Company, Chicago.—Model reinforced concrete locomotive coaling plant; model cinder plant; photographs of completed coal, sand and cinder handling machinery. Represented by Clyde P. Ross, David E. White, Charles Corwin, Wm. F. Hunt and Benjamin Bruce Shaw. Space 34.

Roberts Company, Geo. J., Dayton, Ohio.—Railroad water treating plant. Represented by John C. Jamieson and H. F. Ostendorf. Space 282.

Robertson & Co., Wm., Chicago.—Cast iron sectional culvert; cinder conveyor. Represented by R. F. Repasz. Space 184.

Robertson Company, H. H., Pittsburgh, Pa.—Protected metal roofing and siding sheets; ventilator; skylights and sidewall sash; **smokejack.** Represented by J. R. Sexton, D. W. Jasper, E. F. Beach, E. H. Wasmuth, Pierre Blommers and F. C. Russell. Space 246 and 247.

Sears Roebuck & Co., Chicago.—Vises; shovels; scoops; **sectional tool houses.** Represented by C. A. McCarthy. Space 221 and 222.

Sellers Manufacturing Company, Chicago.—Wrought iron tie plates; wrought iron guard rail tie plates; tie plate specialties. Represented by J. M. Sellers, W. L. Helliwell, S. H. Smith, G. M. Hogan, R. A. Van Houten, R. J. Platt and A. F. McCoole. Space 124.

Sherwin-Williams Co., Cleveland, Ohio.—Represented by Arthur Larkens, C. H. Proseus, R. V. Goodremont, G. A. Dorwart and W. F. Gallenger. Space 125.

Signal Accessories Corpn., Utica, N. Y.—Switchpoint adjusters; electric locks; signal blades; rail braces; flashing relays; time relays; foundation extensions; **relays; highway crossing signs and signals.** Represented by J. C. Edwards, M. R. Briney, J. J. Hubbard, C. B. Semple, E. Shannahan, J. A. Beynon and W. R. Burke. Space 13.

Simmons-Boardman Publishing Company, New York City.—Railway publications: *Railway Age; Railway Engineering and Maintenance; Railway Signaling; Railway Mechnical Engneer; Railway Electrical Engineer; Boiler Maker; Marine Engineering; Railway Engineering and Maintenance of Way Cyclopedia;* **books.** Represented by L. B. Sherman, Henry Lee, C. R. Mills, F. H. Thompson, J. M. Rutherford, J. G. Little, Fred C. Koch, H. A. Morrison, Geo. Slate, B. L. Hartz, Samuel O. Dunn, E. T. Howson, D. A. Steel, J. H. Dunn, R. S. Kenrick, J. C. Emery, F. M. Patterson, N. D. Howard, R. F. Duysters and H. E. McCandless. Spaces 287 and 288.

Sinning Track Liner Company, Ramsey, Ill.—**Track liner.** Represented by F. R. Sinning, Stanley Smith, R. R. Dinklage, J. A. Moffitt, Frank Reagan and A. F. McCoole. Space 171½.

Skelton Shovel Company, Inc., Dunkirk, N. Y. Railroad shovels; **heat-treated track shovels.** Represented by E. W. McCarty and H. C. Branahl. Space 9½.

Snow Construction Company, T. W., Chicago.—Water-cranes; tank valves; sand dryer; telltales; valves; coaling station; **tanks.** Represented by Barton Snow, O. D. Snow, B. L. Walker, A. D. Hobson, W. A. Lathrop and A. Kendall. Space 107½ and 108.

Southern Signal Company, Louisville, Ky.—Highway crossing signal; supplies; **illuminated stop sign; flasher; stop sign; lighting relay; parkway outlet; bell wire outlet; wire clamp; mechanical time release; relay box and battery cast.** Represented by J. E. Clough, J. E. Butler, L. R. Zehnder, Mrs. M. E. Pippenger and C. F. Jones. Space 238.

Sullivan Machinery Company, Chicago.—Air lift pumping equipment, including two operating models; portable compressed air hoist; concrete breaker; hammer drill; clay spader; **operating model of deep well.** Represented by John Oliphant, A. S. Gilbert, R. W. Scott and S. B. King. Space 253.

Templeton, Kenly & Co., Ltd., Chicago.—Tie spacing shoes; track and bridge jacks. Represented by H. B. Burlow, C. A. Crane, Jr., J. L. Crowley, W. H. Kreer, G. L. Mayer, Wm. Simpson and W. B. Templeton. Space 32 and 33.

Torchweld Equipment Company, Chicago.—Gas welding and cutting. Represented by W. A. Slack, C. F. Egbert, J. M. Cameron, R. C. Gutke, J. L. Jensen. Space 5.

Union Switch & Signal Co., Swissvale, Pa.—Signals; a.c. relays; d.c. relays; relay cabinet; instrument cases; transformers; reactors; lightning arrester; **telegraph selector; jack box; circuit controller; color light signal; relay for approach lighting of signals; highway crossing signals; track relay.** Represented by G. A. Blackmore, J. S. Hobson, W. J. Gillingham, L. F. Howard, W. H. Cadwallader, W. W. Talbert, Geo. Marloff, Roy H. Clayburn, C. G. Harwig, J. K. Mickley, J. L. Loucks, J. P. Coleman, T. J. O'Meara, W. B. Rudd, C. R. Beall, W. C. McWhirter, W. P. Allen, H. M. McCready, A. Dean, H. W. Griffin, H. R. Sheene and S. E. Gillespie. Space 67 to 69.

U. S. Wind Engine & Pump Co., Batavia, Ill.—Water tanks; water columns; switch stands; semaphores; pumps; outlet and float valves. Represented by L. E. Wolcott, C. E. Ward, J. P. Prindle, G. E. Vermilyer and T. S. Daniels. Space 111 and 112.

Universal Generator Company, Blossburg, Pa.—Portable flood lights. Represented by B. W. Leonard and F. E. Mull. Space 250.

Verona Tool Works, Pittsburgh, Pa.—Rail joint spring; track circuit bond; track jack; ratchet action track wrench; levels; gages; shovels; **rail anchor; track chisel; adze; spike maul; car stopper.** Represented by Wm. F. Hart, W. W. Glosser, Milburn Moore, P. L. Laughlin, B. M. Cheney, D. L. Crawford, A. C. Laessig, W. C. Dawkins and C. G. Ericson. Space 129 and 148.

Warren Tool & Forge Company, Warren, Ohio.—Chisels; spike mauls; adzes; track tools. Represented by J. D. Robertson, H. C. Mull, D. J. Merwin, E. L. Ruby and Jos. F. Leonard. Space 9.

Waterbury Battery Company, Waterbury, Conn.—Primary battery cells, renewals and parts. Represented by M. L. Martus, G. A. Nelson, S. T. Hough, G. S. Gaunt and O. B. Frink. Space 39.

Weir Kilby Corporation, Cincinnati, Ohio. Manganese rail bound frog; **guard rail clamp; main line switch stand.** Represented by C. E. Hogan and H. G. Barclay. Space 213.

Westburg Engineering Company, Chicago.—Electrical indicating instruments; tachometer; motor starters; controllers; resistance units. Represented by Paul A. Westburg, Leon C. Herrman, A. Thielke, Jas. F. Inman, Cline Gray, J. J. Dunleavy and M. Trapnell. Space 160.

Western Wheeled Scraper Company, Aurora, Ill.—Working models and moving pictures of dump cars. Represented by Jess Mossgrove; J. E. Huber, John W. Patterson, P. F. Smith and H. B. Bushnell. Space 63.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Train speed indicator; safety switches; lightning arrester demonstration; floodlight, chromium plated; electric meters; **new drive for speed indicator; automatic electric arc welding; chromium plated reflector for floodlight.** Represented by F. M. Hunter. Space 56 and 57.

Wharton, Jr., & Co., Inc., Wm., Easton, Pa.—Manganese steel self-guarded frog; rail-bound frog; gage rod; **insulated gage rod.** Represented by H. F. McDermott, Victor Angerer, Charles M. Griffith, Robt. C. McCloy, Walter Allen and J. R. Smith. Space 52½ and 53.

Wood Conversion Company, Chicago.—Refrigerator car insulation; steel passenger car insulation; vibrating machine to show adaptability. Represented by D. H. Corlette and A. H. Purdom. Space 220.

Wood, Iron & Steel Co., Alan, Philadelphia, Pa.—Highway crossing equipped with rolled steel traffic treads; one section of plank flooring for bridges equipped with rolled steel traffic treads; locomotive runner board; locomotive apron plate; locomotive step. Represented by M. L Wagner and J. R. Jones, Jr. Space 201.

Wood Shovel & Tool Company, Piqua, Ohio.—Track shovels; locomotive firing scoops. Represented by C. L. Butts and H. L. Gilliam. Space 192.

Woolery Machine Company, Minneapolis, Minn.—Motor car engines; motor cars; weed plows; two-speed transmission for motor cars; **heavy duty steel frame car.** Represented by H. E. Woolery, D. A. Woolery, C. E. Berg, C. C. Tambornino, J. T. Stephenson, T. J. Feely, A. H. Sprute and G. F. Akin. Space 231, 232 and 233.

Wyoming Shovel Works, Wyoming, Pa.—Track shovels; locomotive scoops; picks; scuffle hoes; machine to test track shovels. Represented by H. T. Potter, Stanley H. Smith, E. L. Ruby and M. S. Hendrickson. Space 101.

Zenith Shovel Company, Chicago.—Track shovels. Represented by Hans N. Nilssen, Geo. McQuade, J. B. Lathrop and W. H. True. Space 7.

National Railway Appliances Assn. Holds Annual Meeting

INCREASED attendance at the annual meetings of the National Railway Appliances Association has been noticed each year for the past four years, and it was noticed and commented on yesterday morning in the meeting room at the Coliseum when President Gillingham called the gathering to order.

The president had no prepared address, but simply reported that the affairs of the association were in good shape and that all was "set" in the Coliseum this year for a most successful exhibit. Calling the attention of the members to the increased attendance in the Coliseum each year he cited the fact that in 1923

24,000 people inspected the exhibits, in 1924 over 40,000 attended the showing and that in 1926 he hoped and fully expected the 1923 attendance would be more than doubled.

President Gillingham concluded his brief remarks with the statement that through the acquiring of the church property adjoining the Coliseum on the north the amount of exhibit space had been greatly increased, with keen satisfaction to all.

Secretary-Treasurer Kelly responded briefly as to the association's activities. He stated that by reason of the securing of considerable additional exhibit space for the exhibits of 1925 and 1926, there would probably be a deficit this year of about $2600. He added that there were 188 exhibiting members this year as against 182 exhibitors last year and that there were 19 associate members this year as against the same number last year. He also called attention to the new lighting system in the Coliseum this year, the management having installed 90 large chandeliers in the main building and 16 or 18 in the north hall, thereby greatly improving the lighting system in the entire building. He concluded his remarks by thanking the members for prompt shipments of exhibits this year, a great improvement over last year.

Following the report of the secretary-treasurer the president called for the report of the Nominating committee, which was read by A. J. Filkins as chairman. The report was as follows:

President—W. B. Murray, Miller Train Control Corporation, Danville, Ill.

Vice-president—L. E. Weidman, The Frog, Switch & Manufacturing Company, Carlisle, Pa.

Secretary-Treasurer—C. W. Kelly, National Railway Appliances Association, Chicago.

Directors—A. L. Greenabaum, O. F. Jordan Co., East Chicago, Ind., for one year to fill an unexpired term; S. P. McGough, Lorain Steel Company, Johnstown, Pa., for one year; A. S. Anderson, Adams & Westlake Company, Chicago, for three years. The report of the nominating committee was adopted, without dissent.

W. B. Murray

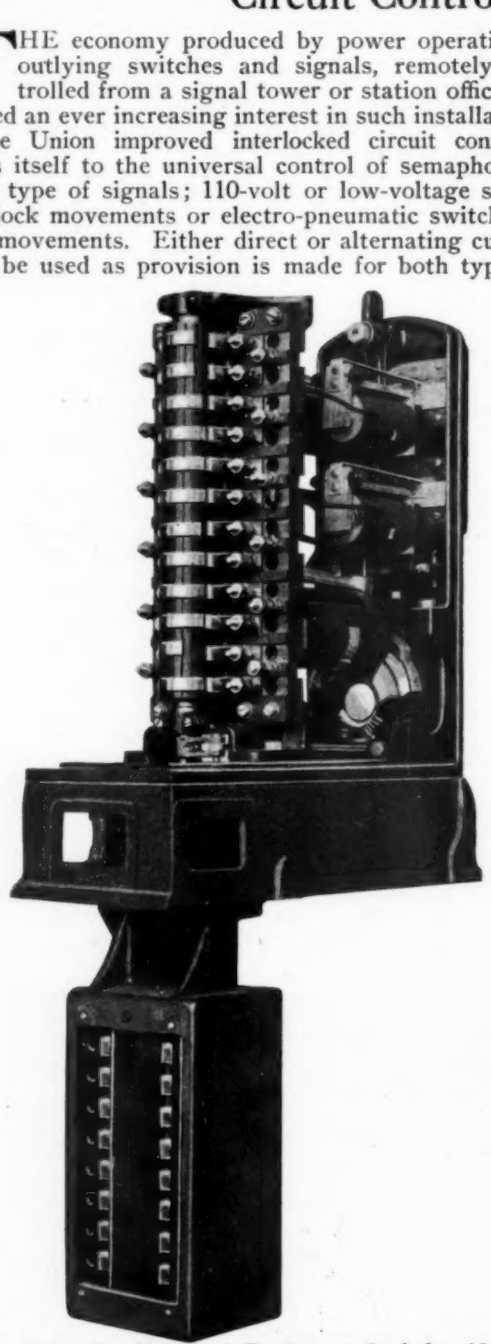
W. B. Murray, vice-president of the Murray Train Control Corporation, with headquarters at Danville, Ill., has been elected president of the National Railway Appliances Association. Mr. Murray was born at Dunkirk, N. Y., on August 5, 1875. He entered railroad service in 1893 and was successively a fireman and an engineer of the Portland Mount Tabor railway, Portland, Ore., until 1897. From that date until 1899 he was engaged in engineering studies at New Haven, Conn. In 1900 he entered the service of the Hill & Miller Electrical Company, Washington, D. C., as construction engineer. In 1905 he was general manager of the Murray Engineering & Construction Company, while from 1907 to 1911 he was a consulting engineer. He first became connected with the Miller Train Control Corp., in 1909 and since 1911 he has devoted his entire time to this organization.

Car Retarders Installed—The Illinois Central placed an electro-pneumatic car retarder system in service on the northbound hump of the Markham classification yard at 9 o'clock yesterday morning. This car retarder system, as manufactured and installed by the Union Switch & Signal Company, is the first electro-pneumatic installation to be placed in service with the exception of the development of car retarders as tried out by the Indiana Harbor Belt.

Improved Type of Circuit Controller

THE economy produced by power operation of outlying switches and signals, remotely controlled from a signal tower or station office, has caused an ever increasing interest in such installations.

The Union improved interlocked circuit controller lends itself to the universal control of semaphore or light type of signals; 110-volt or low-voltage switch and lock movements or electro-pneumatic switch and lock movements. Either direct or alternating current may be used as provision is made for both types of



Circuit Controller Standard Equipment Includes 12 Contacts but Means Are Provided for 8 Additional Contacts

magnets for electric locks and indicators. It incorporates all of the features found in any modern power interlocking machine lever and has been especially developed to meet the exacting requirements of safety which have to be established in connection with the remote control of switches and signals.

Twelve contacts constitute the standard equipment of this circuit controller but ready means are provided for eight additional auxiliary contacts.

Control levers are long and travel through an arc of 90 degrees, thus insuring not only ease of movement but also no confusion on the part of the operator

as to the position in which levers may be left standing. Large size contact rollers are caused to rotate through 120 deg., thereby assuring reliable adjustment of contacts.

A feature of this Union controller is the information afforded by a maximum of four indicators per unit. In the switch control unit the indicators may be arranged to show the position of the switch as normal or reverse; whether the track circuit in which the switch is located is occupied or unoccupied; and whether the lever is electrically locked or unlocked. This last function may be effected by linking the indicator directly with the electric lock. Indicators on signal control units may show directional approach of trains; whether what may be termed the "home" block is occupied or unoccupied; and whether the lever is electrically locked or unlocked.

Mechanical interlocking between units is of the miniature S. & F. type, the same as is used in the Union Model-14 power interlocking machine. Ample space is provided behind the mechanical locking for reception of external wiring and liberal mechanical clearances throughout guard against congestion of wires and their interference with moving parts.

The lock segment is provided with a forged drop feature which guarantees that the armature of the electric lock drops into engagement with the notches of the lock segment. This guarantees against a false release of the lever as a result of mechanical sticking of the electric lock.

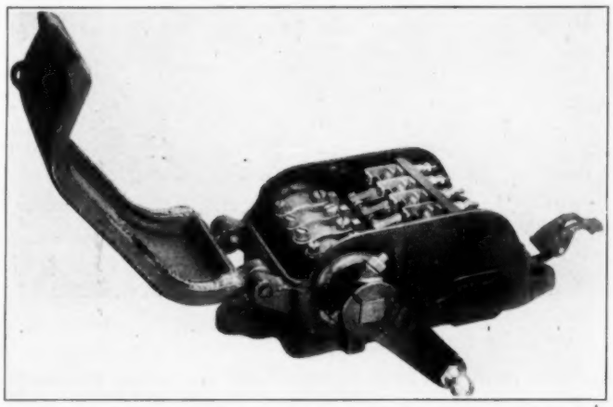
The use of time locking to guarantee against taking a signal away from an approaching train and immediately changing the position of a switch in a route, is readily realized by means of a mercury time release application which can be furnished with the improved circuit controller.

Two Units of New Union Improved Type Desk Lever Interlocked Circuit Controller

These units are shipped completely assembled and practically the only work to be done in connection with their installation is the wiring up of the circuits leading to the unit.

Switch Controller Has Special Adjustment Features

A NEW switch circuit controller designed to secure simplicity and positiveness in adjustment has been placed on the market by the Chicago Railway Signal & Supply Company. Four contact fingers are used, each equipped with front and back contacts. In order to insure against grounds the contacts and fingers are insulated from the case on a heavy bakelite base. Standard A.R.A. terminals, 12 in number, are mounted on the same panel with the controller



New Switch Controller Has Improved Adjustment Features

An insulating link ½ in. square and 1¼ in. long connects each finger with the arm that engages with the cam. To reduce friction to the minimum, a hardened steel roller is used to transmit the rotary motion of the cam to the contact finger control arm. The cams are mounted on a 1½ in. cam shaft and can be adjusted by means of a worm screw arrangement, locked by a clamp. Special cams are furnished for installation at points requiring switch controller contacts to make and break during the stroke of the switch. The overall dimensions of the new switch circuit controller are 7½ in. by 15 in. by 6 in.

An Effective Non-Derailer

A NEW non-derailer which has given effective service on car float bridges at the Brooklyn Eastern District Terminal, New York, is being marketed by the Ramapo Ajax Corporation, Hillburn, N. Y. This non-derailer is designed to prevent derailments not only on car float bridges but at turntables, transfer pits and all non-alining rail connections. It is of solid construction, being made of manganese steel with all bolt holes cored and ribbed to give added strength. The surfaces and edges, being machined, afford a finished appearance. The non-derailer has a flare at the rail gap, narrowing down to the rail 27 in. back of the gap, so that a wheel passing from the end of one rail and finding the abutting rail out of alinement will have its flange caught by the flare of the derailer and as the wheel advances it will be drawn onto the rail. The new non-derailer is easily installed and involves no maintenance expense. When applied at all rail ends on transfer pits, turntables, etc., derailments are said to be impossible, with resultant prevention of track, car and engine damage, and tie-ups due to equipment off the track.

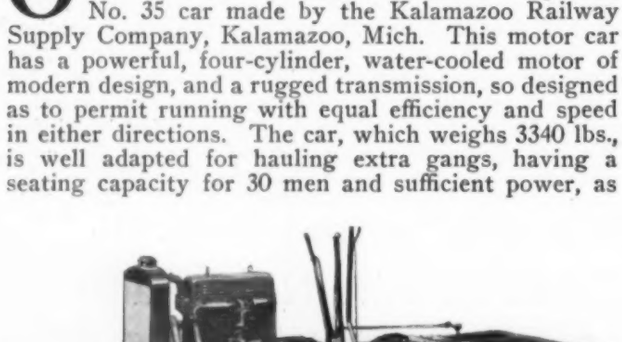
In addition, the movement of equipment over transfer pits and turntables is expedited.

Reports received from these non-derailers installed at the Ninth street float bridge in Brooklyn are to the effect that they eliminate an average of two derailments a month which occurred at this point previous to the non-derailer installation, saving $50 for each derailment plus the cost of occasional transfers of lading and consequent delays.

An Effective Non-Derailer

Improved Motor Car Exhibited

ONE of the motor cars exhibited this year at the Coliseum for the first time is the improved No. 35 car made by the Kalamazoo Railway Supply Company, Kalamazoo, Mich. This motor car has a powerful, four-cylinder, water-cooled motor of modern design, and a rugged transmission, so designed as to permit running with equal efficiency and speed in either directions. The car, which weighs 3340 lbs., is well adapted for hauling extra gangs, having a seating capacity for 30 men and sufficient power, as well, to haul loaded trailers up the grades found in hump yards or on logging railroads. Various body types can be built on the standard chassis to suit specific requirements and when used as an inspection car, or for other similar purposes, a passenger car body seating either 12 or 23 passengers and affording them full protection from the weather, can be provided.

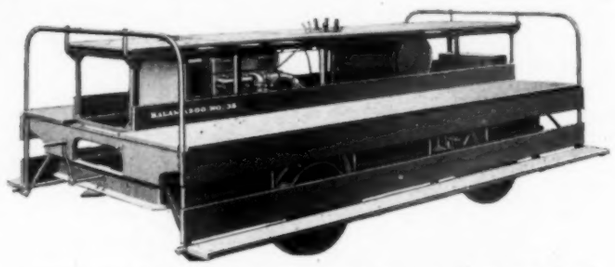


Standard Chassis of No. 35 Motor Car

The water-cooled gasoline engine with 4-in. by 5-in. cylinders develops 35 to 45 brake hp. and is provided with force feed lubrication, pump circulation of cooling water, a high tension magneto, an extra large radiator and an adjustable velocity governor which limits the speeds to prevent accidents and the abuse of the motor.

The standard, heavy-duty, geared transmission is provided with three speeds forward and one reverse, coupled to a special reverse gear giving four gear ratios in each direction. The reverse gear runs in Timken roller bearings, all wearing parts being hardened and ground and running in oil. The drive is by a heavy roller chain with detachable links to a hardened and ground countershaft, also running in roller bearings and driving to each axle, thus utilizing the entire weight of the car for securing traction.

The 2½-in. axles run in large, heavy-duty roller bearings carried in spring-supported housings and mounted in malleable iron pedestals. Brake action is applied on all four wheels by means of heavy toggle irons and links, the brake blocks being faced with replaceable cast iron shoes. Heavy cast steel wheels, 20 in. in diameter and with M. C. B. standard treads are furnished. The frame of the car is of 5-in. standard channel steel, riveted and welded into one unit, tow irons being provided at each end.



Kalamazoo No. 35 Motor Car With Standard Body Which Will Seat 30 Men

All control levers are conveniently located, occupying but a small space. Speeds from 2 to 30 miles an hour are available with the standard car, but either higher or lower speeds can be furnished, according to the service requirements. The fuel tank has a capacity of 16 gal. An electric starter and light may be furnished as extra equipment when the particular work make this desirable.

G. L. Moore Leaves Railway Service

The many friends of G. L. Moore, engineer maintenance of way of the Lehigh Valley, with headquarters at Bethlehem, Pa., will be interested to learn of his resignation to become president of the Arcco Anti-Rail Creeping Company, with temporary headquarters at Owego, N. Y. Mr. Moore was born at Dunkirk, N. Y., in 1873, and entered railway service as a rodman on the Erie in 1890, remaining with that road for 10 years, during which time he advanced through the positions of assistant engineer and track supervisor to division engineer. He left the Erie in 1900 to become a division engineer on the Chicago & Alton, later being promoted to engineer maintenance of way. In 1904 he became chief engineer of the Rutland, which position he resigned in 1909 to become engineer maintenance of way of the Lehigh Valley, which position he has held until this time. Mr. Moore has taken active part in the work of the engineering association, being a member of the Rail committee for a number of years and chairman for the last two years.